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Hydrogeology and Water Supply Wells
Catoctin Mountain Park

Natural Resource Report NPS/NRPC/WRD/NRTR—2007/374

ON THE COVER
Entrance to Catoctin Mountain Park
Photograph by: Frank Noe, Baltimore, MD

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Natural Resource Report NPS/NRPC/WRD/NRTR—2007/374

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gpm	gallons per minute	
gpd	gallons per day	
cfs	cubic feet per second	1 cfs = 450 gpm

Summary

Groundwater pumped from wells in Catoctin Mountain Park is obtained from fractures in the underlying metamorphic rocks. There appears to be no consistent relationship between the hydrogeologic setting of well locations and well yield. Wells within close proximity and constructed in similar hydrogeologic settings may produce large volumes of water, or nearly nothing. Well yield is entirely dependent on the amount of fractured rock encountered at depth and the water-bearing characteristics of those fractures.

The potential for constructing wells with large yields can be increased by locating them on the east side of stream valleys. Infiltration of water in stream valleys will eventually reach the underlying southeasterly dipping bedrock and follow bedding planes and fractures downdip, toward the southeast. Thus, a well located downdip of a stream (recharge source) will have a better chance of producing water than wells in other locations.

There is sufficient pumping capacity from existing wells in the park to meet current demand. No additional facilities are planned. If additional supplies are needed in the future, some of the existing low-volume wells could be developed as supplemental water sources.

Introduction

Catoctin Mountain Park covers nearly 6000 acres of mountainous terrain in the Blue Ridge Province of western Maryland. The park contains several camp/cabin areas dating back to the era of the Great Depression. Over the years, approximately 20 wells have been drilled in the park to provide water for NPS facilities. Only about half of those wells were deemed successful; producing enough water to be developed and equipped with pumps.

This report summarizes the hydrogeology and the history of well drilling in the park. Although there appears to be no definite pattern or geologic conditions that will insure successful well drilling, the chances for success can be improved by locating future wells on the east side of perennial streams to take advantage of the streams as a potential source of groundwater recharge.

Previous Investigations

The geology of the park and surrounding area has been mapped by Whitaker (1955), Fauth (1977), and Southworth and Denenny (2006).

Nutter (1971) supervised construction and testing of a water supply well at the Camp Peniel environmental education center. The facility is now the headquarters and administrative offices for the park.

Huth Engineers (1981) evaluated wastewater disposal systems, water supply systems, and fire protection systems for the Camp Greentop and Camp Round Meadow areas.

Trombley and Zynjuk (1985) reported on the hydrogeology and water quality of the park. Their work included sampling and analyses of water quality for wells, springs, and streams throughout the park. They also supervised construction and testing of a new well at Quarters #5 and investigated the potential for infiltration from sewage treatment facilities at Camp Round Meadow to affect groundwater quality at nearby wells.

Dine, Tompkins, and Duigon (1985) compiled basic data for water wells in Frederick County. Duigon and Dine (1987) provided an assessment of water resources of Frederick County to provide the basic hydrologic background for planning, development, and other activities.

Geology and Hydrogeology

Catoctin Mountain Park is situated on the east limb of the Blue Ridge-South Mountain anticlinorium, immediately west of the transition from the Piedmont to the Blue Ridge physiographic provinces (Figure 1). Geologic formations underlying the park dip toward the southeast (Southworth and Denenny, 2006).

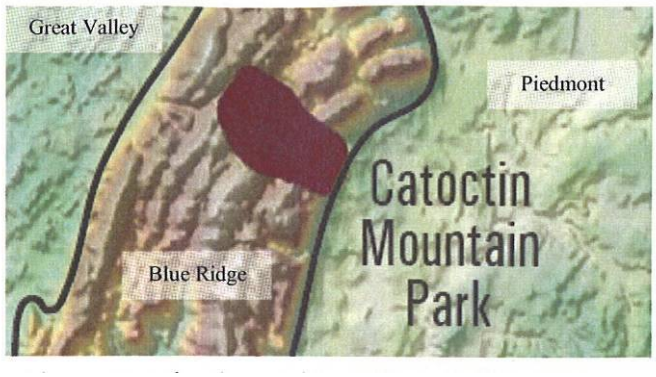

Figure 1. Physiographic setting of Catoctin Mountain Park.

The park is underlain by PreCambrian metamorphic rocks. The western part of the park is underlain by Catoctin Formation. The two main types of rocks comprising the Catoctin Formation are a greenish-gray metabasalt and a bluish-grayish metarhyolite. The eastern part of the park is underlain by the Loudoun Formation, which is comprised of phyllite and conglomerate units. Overlying the Loudoun, and outcropping in the very eastern part of the park, is the Weverton Formation. The Weverton is comprised of a sequence of interbedded quartzite, phyllite, and conglomerate. A geologic map of the park and a geological cross section are provided in Figure 2.

The metabasalt and metarhyolite rocks comprising the Catoctin Formation were originally deposited as molten rock from volcanic eruptions. The volcanic rocks were later covered by quartz sand deposited as river sediments. These geologic units were subsequently buried and

subjected to heat and pressure to metamorphose into their current state. The units were then uplifted by mountain-building processes and uncovered by erosion of the overlying rocks.

Landforms and topography in Catoctin Mountain Park are largely a function of the type of bedrock. The rock near the contacts between geologic units tends to be more fractured, and thus more easily eroded, than rock from the interior parts of the formations. Linear valleys that parallel the northeast-trending bedding and foliation planes of the bedrock have formed along the contacts between the Catoctin and Loudoun Formations and between the metabasalt and metarhyolite comprising the Catoctin Formation (Southworth and Denenny, 2006).

Rock units in the park are highly fractured and folded. The major axes of folding and cleavage planes strike northeast-southwest. Cleavage along bedding planes and fractures dip toward the southeast at approximately 45 degrees (Trombley and Zynjuk, 1985).

Groundwater in the park occurs in the regolith zone overlying unweathered bedrock and within fracture zones in the bedrock. The regolith is comprised of all of the soil and rock material overlying the unaltered bedrock and includes both material that has been transported and material that has weathered in place. The regolith is thinner at the top of Catoctin Mountain and along ridges and thicker in the valleys. The regolith has moderate porosity and permeability. It is the principal aquifer in the park. Groundwater also occurs in the openings along bedding planes, cleavage planes, joints, and faults within the bedrock. The number, size, and interconnectivity of these openings determine the water-producing potential of the bedrock. In general, bedrock openings decrease with depth as the weight of the overlying rock tends to squeeze the openings closed. Areas underlying valleys tend to be better locations for wells because there is a constant source of recharge from infiltration of water from streams.

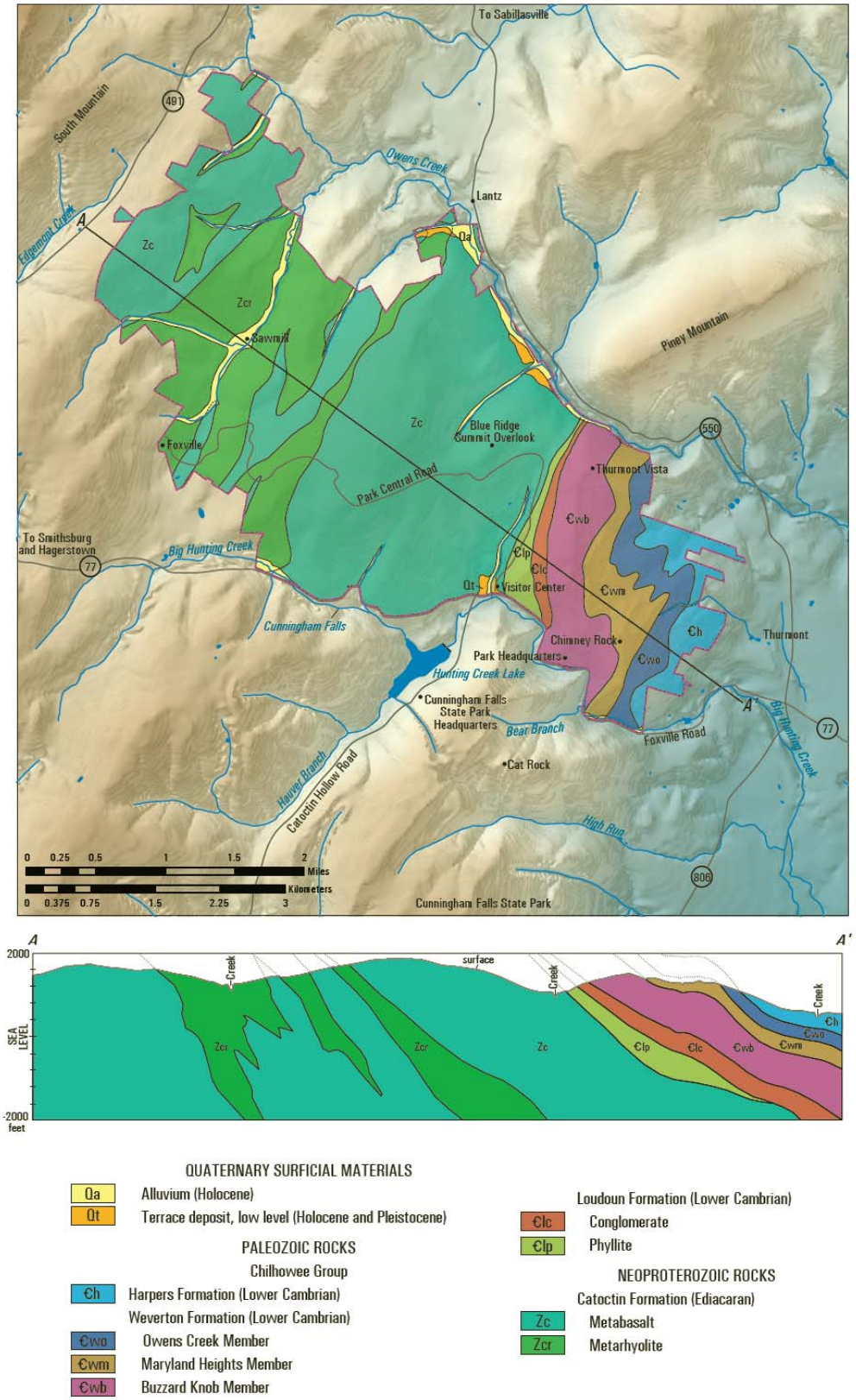

Figure 2. Geologic map and cross section of Catoctin Mountain Park (from Southworth and Denenny, 2006).

Trombley and Zynjuk (1985) estimate that the regolith extends to a depth of about 200 feet at Camp Round Meadow. The regolith is less thick beneath the ridges and mountains. The success of a well constructed at Catoction depends on the thickness of the regolith, the thickness and degree of fracturing in the bedrock, and the degree of interconnectivity with surrounding fractured rock. As a general guideline, test holes for water supply wells probably do not need to exceed 300 feet deep.

Well Inventory

Table 1 is a listing of all wells in Catoctin Mountain Park. It does not include wells and test holes at The Presidential Retreat or the Naval Support Facility, Thurmont, at Round Meadow. Well completion reports (as available) are attached as an appendix to this report. Well completion reports could not be found for every well.

Table 1 shows that none of the water supply wells constructed in 1983 and earlier were more than 250 feet deep, and many of them were capable of producing more than 30 gpm; some had a capacity exceeding 50 gpm. Wells constructed in 2002 and 2006 ranged in depth from 400-800 feet, but did not have a better ratio of success than did shallower wells constructed in preceding years. Both of the 800-foot deep wells did not produce enough water to warrant development as water supply sources.

Water Systems/Active Wells

There are currently four water systems at Catoctin Mountain Park: Headquarters, Blue Blazes, Round Meadow, and the Ike Smith water system. Quarters No. 5 and No. 6 are single family residences that are each supplied by a domestic well.

The Naval Support Facility, Thurmont, operates several wells in the Round Meadow area to supply water for The Presidential Retreat. Information for these wells is not readily available and they are not discussed in this report.

Table 1. Wells in Catoctin Mountain Park

Well Number (MGS)	State Permit Number (well tag no.)	Well Name	Year Const.	Depth feet	Yield, gpm	Use* (2007)
FR-BD-5	---	Jim Brown 0	1936	40	8.5	Abandoned
FR-BD-6	FR-01-8989	Greentop	1955	230	25	Inactive
FR-BD-7	FR-02-1967 FR-02-5349	Misty Mount 1 Deepen MM 1	1956 1956	76 180	3.6	Inactive
FR-BD-8	FR-02-5350	Misty Mount 2	1956	127	24	Inactive
FR-BD-34	FR-03-2795	Blue Blazes 1	1959	230	32	BB/MM
FR-BD-40	FR-66-0492	Poplar Grove 1	1966	180	40	IS
FR-BD-41	FR-66-0489	Poplar Grove 2	1966	160	33	IS
FR-BD-43	FR-66-0490	Jim Brown 1	1966	120	74	RM
FR-BD-44	FR-66-0491	Jim Brown 2	1966	247	8.5	Inactive
FR-BD-49	FR-71-0428	Headquarters	1971	202	19	HQ
FR-BD-114	FR-81-1284	Quarters 5	1983	145	60	SFD
	---	Quarters 6		120		SFD
	FR-94-3010	Jim Brown 3	2002	800	6	Inactive
	FR-94-3011	Jim Brown 4	2002	500	140	RM
	FR-95-0125	Ike Smith Test Hole	2006	800	10	Inactive
	FR-95-0126	Test Hole at Blue Blazes	2006	600	10	Inactive
	FR-95-0303	Blue Blazes 2	2006	660	23	BB/MM
	FR-95-0304	Test Hole at Bldg 167	2006	500	15	Inactive
	FR-95-0305	Ike Smith Well	2006	420	100	IS

MGS (column 1) is Maryland Geological Survey

* Active water wells in the park supply water to the following water systems:
BB/MM – Blue Blazes, Misty Mount, Visitor Center
IS – Ike Smith water system supplies Owens Creek, Poplar Grove, Chestnut, Greentop
RM – Round Meadow water system
HQ – Park Headquarters
SFD – Single Family Dwelling

Headquarters

Park Headquarters is at the former site of Camp Peniel, an environmental education camp. A well (FR-71-0428) was constructed there in 1971 (Figure 3). It is 202 feet deep. The well has 6-inch steel casing to 30 feet. The annular space outside the casing was sealed with grout to prevent surface water flow flowing into the well and contaminating the well. The well was completed with a 6-inch open borehole from 30-202 feet. Pumping tests determined that the well has a specific capacity of 1½ gpm/foot of drawdown. The well was test pumped for only 3¼ hours at rates less than 20 gpm. It was conservatively estimated that the well could reliably produce 20 gpm for several hours. Additional testing would be needed to determine the maximum sustained yield of the well if additional water is needed at the headquarters area (Nutter, 1971).

The well was constructed into the Weverton Formation which is a greenish-gray quartzite and quartz conglomerate that has been compacted and metamorphosed to any of the original granular porosity of the quartz sand. Phyllite (metamorphosed shale) is interbedded with the quartzite. Groundwater occurs in joints, faults, and other fractures in the rock.

Blue Blazes

The Blue Blazes Well No. 1 supplies water to all NPS facilities from the Visitor Center to the Misty Mount Cabins, including the roads and trails maintenance building and two houses (HS-128 and PG-167). A second well was constructed near the maintenance building in August 2006 to supplement the supply from the Blue Blazes Well No. 1. Estimated peak demand for this water system is 9,000 gpd in winter and 12,000 gpd in summer. Well locations are shown in Figure 3. The water system has one 33,000 gallon storage tank at Misty Mount.

The Blue Blazes Well No. 1 (FR-03-2795) was constructed in February 1959 and is 230 feet deep. The well obtains water from fractures in the Catoctin Formation. The well produces 20 gpm with the pump that is currently installed. Trombley and Zynjuk (1985) stated that the well could produce 32 gpm. The well was hydrofracked in the early 1990s, resulting in increasing the yield to about 50 gpm.

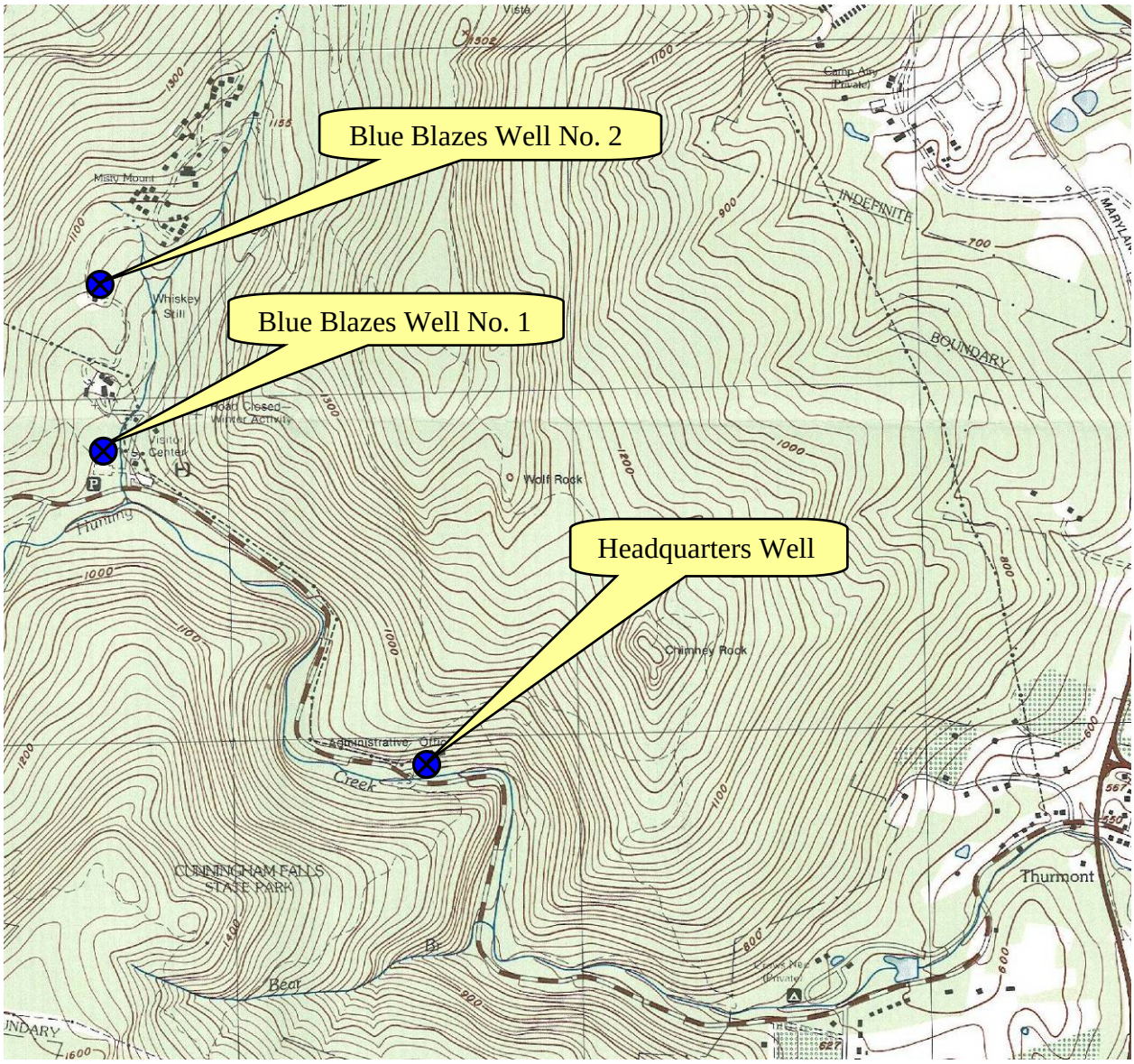

Figure 3. Location of the Headquarters and Blue Blazes Wells.

Blue Blazes Well No. 2 (FR-95-0303) was constructed about 750 feet north of the maintenance shop in August 2006. The well is located at the east edge of a clearing, east of an old barn. Water is obtained from fractures in the Catoctin Formation. The well is 660 feet deep and has 8-inch steel casing with a cement grout seal from 0-58 feet. The well is an open borehole from 58-660 feet. The well was test pumped for 25 hours at 23 gpm, causing the water table to draw down from the static water level of 42 feet below ground surface to 155 feet below ground surface. Figure 4 shows the water level response in the well during test pumping and recovery.

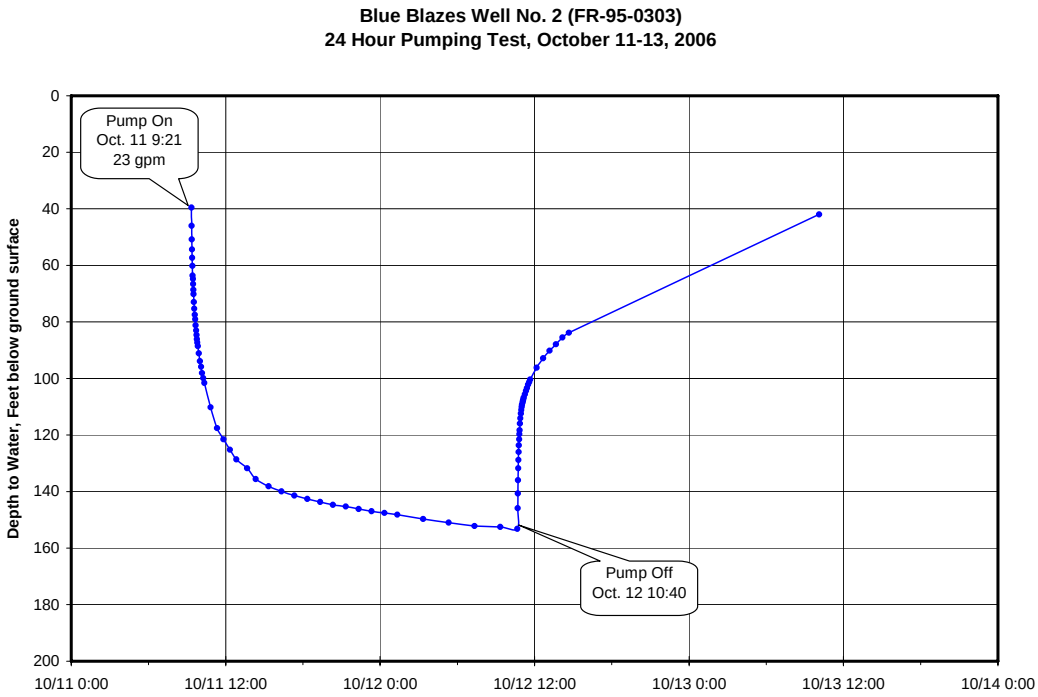

Figure 4. Water level drawdown and recovery during testing of Blue Blazes Well No. 2.

Round Meadow

The Round Meadow water system is supplied by the Jim Brown Wells. There are three inactive wells in the area, which are discussed in a later section of this report. There are two active wells which pump water to two, 33,000-gallon underground tanks. Water is used to supply park service facilities at Round Meadow and the Round Meadow group camp. Well locations are shown on Figure 5.

Jim Brown Well No. 2

Well FR-66-0490 was constructed in March 1966 and is 120 feet deep. The well obtains water from fractures in the Catoctin Formation. The well has 6-inch casing with a grout seal to a depth of 26 feet. The well is a 6-inch open borehole from 26-120 feet. The well was test pumped for 24 hours at 74 gpm, causing the water level to draw down from the static water level of 29 feet to 70 feet below ground surface.

Jim Brown Well No. 4

Well FR-94-3011 was constructed in April 2002 and is 500 feet deep. The well obtains water from fractures in the Catoctin Formation. The well has 8-inch casing with a grout seal to a depth of 55 feet. The well is an 8-inch open borehole from 55-500 feet. The well was test pumped by airlifting for 3 hours at 100 gpm, causing the water level to draw down from the static water level of 50 feet to 500 feet below ground surface.

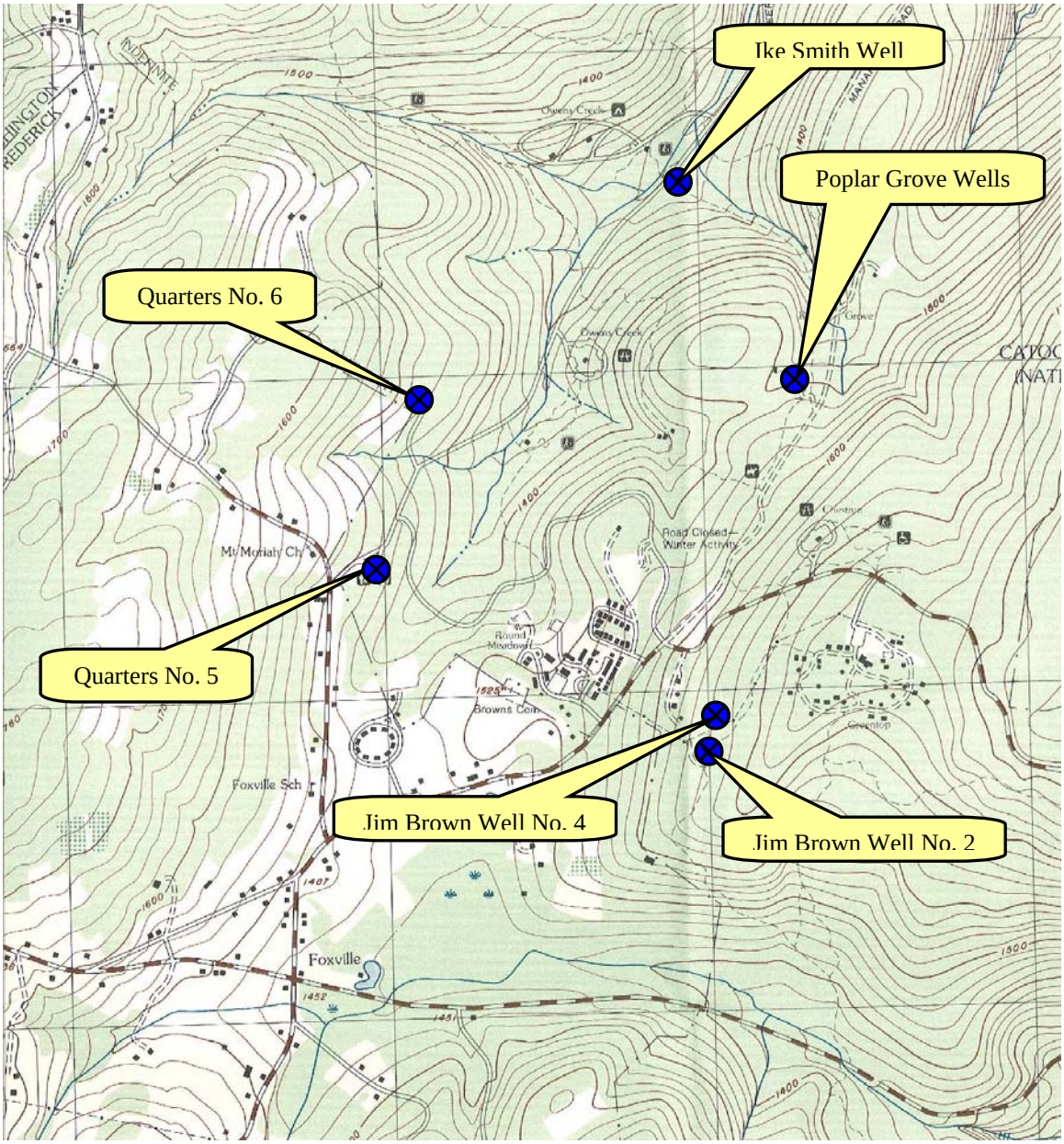

Figure 5. Locations of wells for the Round Meadow and Ike Smith water systems.

Ike Smith Water System

The Ike Smith water system is supplied from two wells at the Poplar Grove II group campsite and the new (2006) Ike Smith Well in the Owens Creek Valley (Figure 5). Water from the wells is pumped to the underground storage tank at the Ike Smith pump house and then pumped to two 33,000 gallon storage tanks north of Camp Greentop. Chlorination for water in this system occurs at each well house as water is pumped from the well. Water from this system supplies Camp Greentop, Poplar Grove group camps, Chestnut Picnic area, and Owens Creek campground and picnic area. Peak demand for this water system is less than 15,000 gpd.

Poplar Grove Wells

There are two water supply wells at the Poplar Grove II group campsite (Figure 5). These wells were constructed in 1966 to replace a surface water source from the Ike Smith Springs.

Well FR-66-0489 was completed in March 1966. It is 160 feet deep and is cased and grouted to a depth of 45 feet. The well is a 6-inch open borehole from 45-160 feet. The well was test pumped for 24 hours at 35 gpm, causing the water level to draw down from the static water level of 55 feet to 86 feet below ground surface.

Well FR-66-0492 was completed in March 1966. It is 180 feet deep and is cased and grouted to a depth of 75 feet. The well is a 6-inch open borehole from 75-160 feet. The well was test pumped for 24 hours at 40 gpm, causing the water level to draw down from the static water level of 60 feet to 85 feet below ground surface.

Ike Smith Well

Two wells were constructed in the vicinity of Ike Smith Springs in the summer of 2006. The first well (FR-95-0125), which was constructed near the springs and pump house, did not produce much water and was capped. Additional information regarding this well is presented in the "Inactive Wells" section of this report. The second well was located in the Owens Creek valley and produces about 100 gpm. This well (FR-95-0305) will be connected to the Camp Greentop, Poplar Grove, Owens Creek water system.

Well FR-95-0305 was constructed in September 2006. It is located on the east side of the Owens Creek valley, at the intersection of the trail from Ike Smith Springs and the Foxville-Deerfield Road (Figure 5). The well is 420 feet deep and is cased and grouted to a depth of 56 feet. The well is an 8-inch open borehole from 56-420 feet. The well was test pumped for 25 hours at 100 gpm, causing the water level to draw down from the static water level of 17 feet to 75 feet below ground surface. Figure 6 shows the water level response in the well during test pumping and recovery.

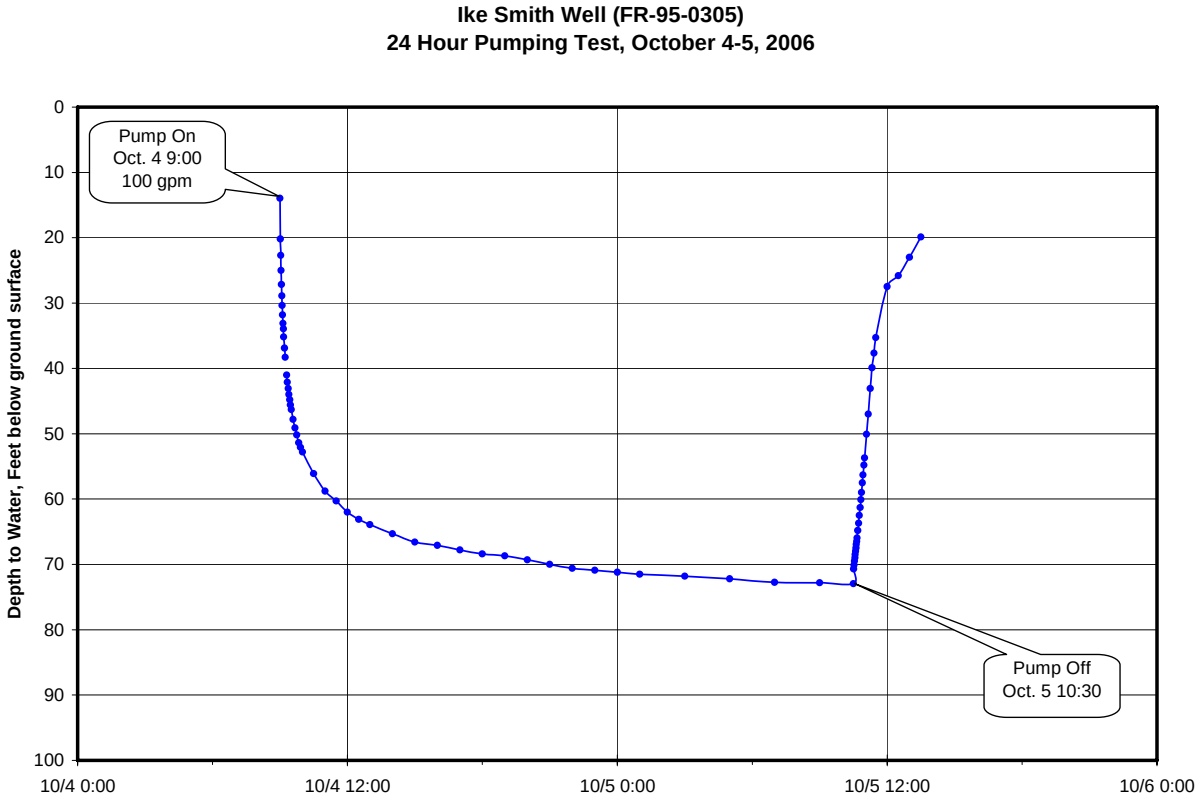

Figure 6. Water level drawdown and recovery during testing of the Ike Smith Well.

Quarters No. 5

The well at Quarters No. 5 (Figure 5) was constructed in 1983 to replace a contaminated spring source. The well is 138 feet deep and 6 inches in diameter. The well was test pumped at 60 gpm for 5 hours, but that pumping rate could not be sustained as the water level in the well was continuing to decline, showing no evidence that the rate of decline was decreasing.

Quarters No. 6

Quarters No. 6 is a single-family home (Figure 5). The well is 120 feet deep and 6 inches in diameter.

Inactive Wells

Several wells in Catoctin Mountain Park are no longer used for one reason or another. Basic data for these wells are included in Table 1. Well completion reports (as available) are included in the appendix of this report. Available information for these wells is summarized in the following sections.

Misty Mount/Blue Blazes Area

There are two inactive wells in the Misty Mount Cabins area (Figure 7). Both wells were located in the north-south trending valley east of the Misty Mount Cabins. The wells were constructed in 1956. Two test wells were drilled in the Blue Blazes area in August and September 2006.

Well FR-02-5349 was constructed in the Winter and Spring of 1956. It was drilled to a depth of 180 feet and produced less than 5 gpm. Water is obtained from fractures in the Catoctin Formation. The well is located east of the creek and about 50 feet north of the entrance road to the Misty Mount Cabins (Figure 7). The well did not produce enough water to warrant installation of a pump. There is no record of it ever being used as a water supply source. Some of the documents in the park files refer to this as Well No. 1 or Well A, as it was the first well drilled in the area.

Well FR-02-5350 was constructed in June 1956. It is located on the east side of the creek and about 300 feet north of Well FR-02-5349 (Figure 7). The well is 127 feet deep and will produce about 25 gpm if its use is limited to about 8 hours per day. Water is obtained from fractures in the Catoctin Formation. The well is on the east side of the creek, and the cabins are on the west side of the creek. Well FR-02-5350 has not been utilized for several years because maintenance of a water line across the creek has always been problematic. However, the well was the sole source of water for the Misty Mount Cabins for many years following its construction until a

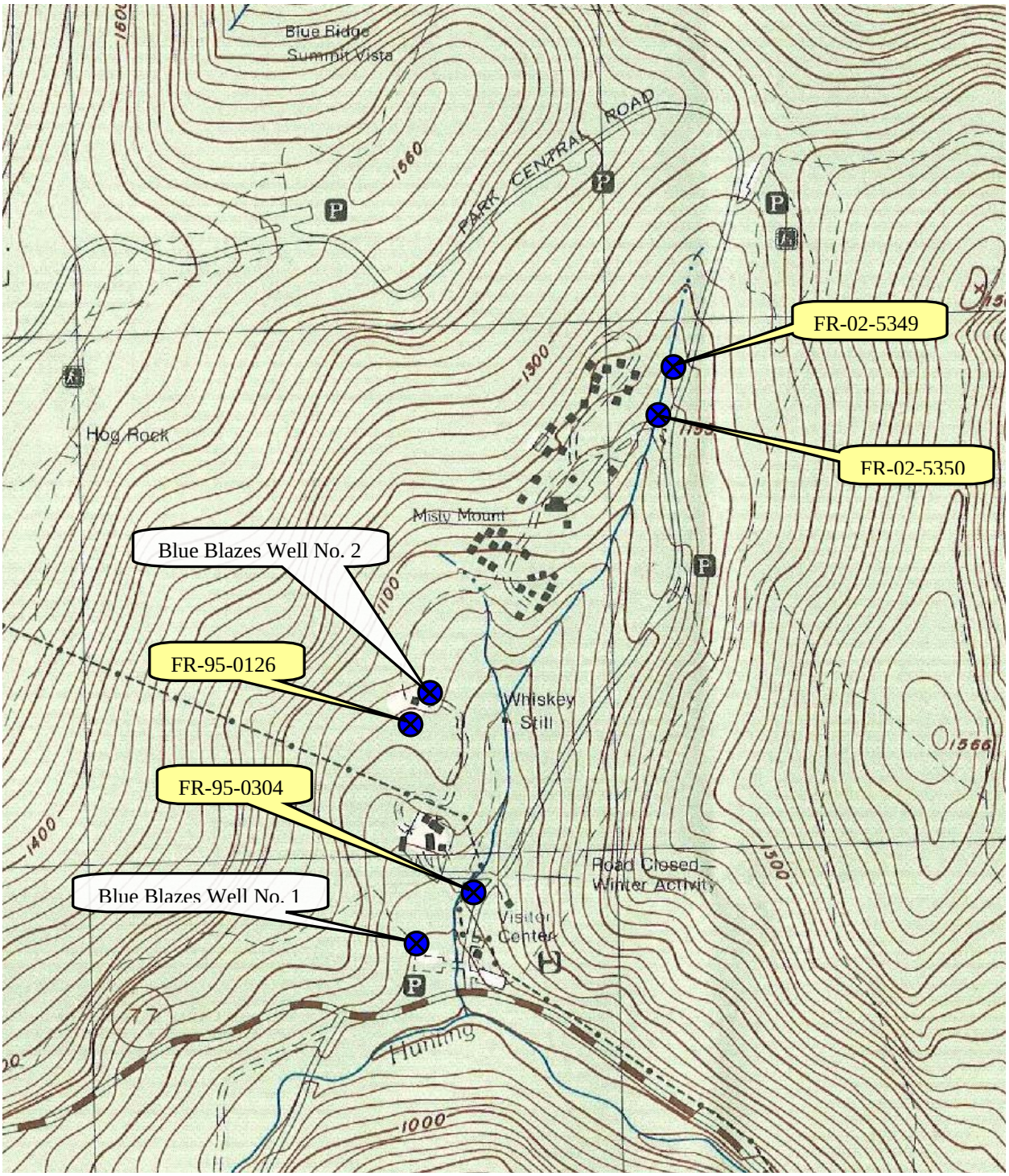

Figure 7. Inactive wells in the Misty Mount/Blue Blazes area.

Location of the active Blue Blazes Wells No. 1 & 2 are shown for reference.

new water system was constructed in 1960(?) and water from the Blue Blazes Well was piped into the area. Some of the documents in the park files refer to this as Well No. 2 or Well B, as it was the second well drilled in the area.

Well FR-95-0126 was constructed in August 2006. It is located north of the maintenance shop, about 300 feet south of the communications tower (Figure 7). The well was drilled to a depth of 600 feet in the Catoctin Formation and was pumped dry in 3 hours when pumped at 10 gpm. The well has been capped, and there are no plans to use it.

Well FR-95-0304 was constructed in September 2006. It is located at the end of the driveway, approximately 60 feet southwest of Building 167 (Figure 7). The well was drilled to a depth of 500 feet deep in the Catoctin Formation and was pumped dry in 3 hours when pumped at 15 gpm. The well has been capped, and there are no plans to use it.

Ike Smith Springs Area

Well FR-95-0125 was constructed at Ike Smith Springs in August 2006 (Figure 8). The well is on the north side of the access road to the pump house and east of the creek. The well was drilled to 800 feet and has 8-inch steel casing grouted in place to a depth of 78 feet. The well is an 8-inch open borehole from 78-800 feet. Production was tested by the air-lifting method for 3 hours. The well was estimated to yield 10 gpm. The well was capped and placed in inactive status due to the low estimated yield.

Greentop

A test hole was drilled north of the Central Park Road near the Greentop entrance in 1955 (Figure 8). The well (FR-01-8989) was drilled to 230 feet deep and was test pumped for 24 hours at 25 gpm, resulting in drawdown of about 10 feet below the static water level of 27 feet below ground surface. These data would seem to indicate the well would be a reliable source of water, but there was concern that the well might be constructed in a “pocket” of fractured rock that might be dewatered during long periods of continuous use or during droughts (Otton, 1955). There is no record that the well was ever equipped with a pump or used as for water supply.

Jim Brown

The original well in the Jim Brown area was 40 feet deep and was constructed in 1936. The well was backfilled with concrete and the casing was cut off below ground surface around 1978. The associated concrete storage tank (approximately 15,000 gallons) was removed about 1980. The original Jim Brown Well was no longer needed after construction of the Jim Brown Well No. 2 provided an alternative source of water for facilities at Round Meaadow.

There are two inactive wells in the Jim Brown area (Figure 8).

The Jim Brown Well No.1 (FR-66-0491) was constructed in April 1966. The well was drilled to 250 feet and has 6-inch steel casing grouted in place to a depth of 46 feet. The well is a 6-inch open borehole from 46-250 feet. The well was test pumped at 10 gpm for 9 hours, causing the water level to draw down from the static level of 21 feet to 53 feet below ground level. The well was capped and placed in inactive status due to the low estimated yield. The well is in the middle of the hiking trail (Catoctin Trail) about 350 feet south of the pump house at Jim Brown Well No.2.

The Jim Brown Well No. 3 (FR-94-3010) was constructed in April 2002. The well was drilled to 800 feet and has 8-inch steel casing grouted in place to a depth of 60 feet. The well is an 8-inch open borehole from 60-800 feet. The well was test pumped by airlifting from 800 feet and produced an average of 6 gpm for 3 hours. The static water level was 50 feet below ground surface. The well was capped and placed in inactive status due to the low estimated yield.

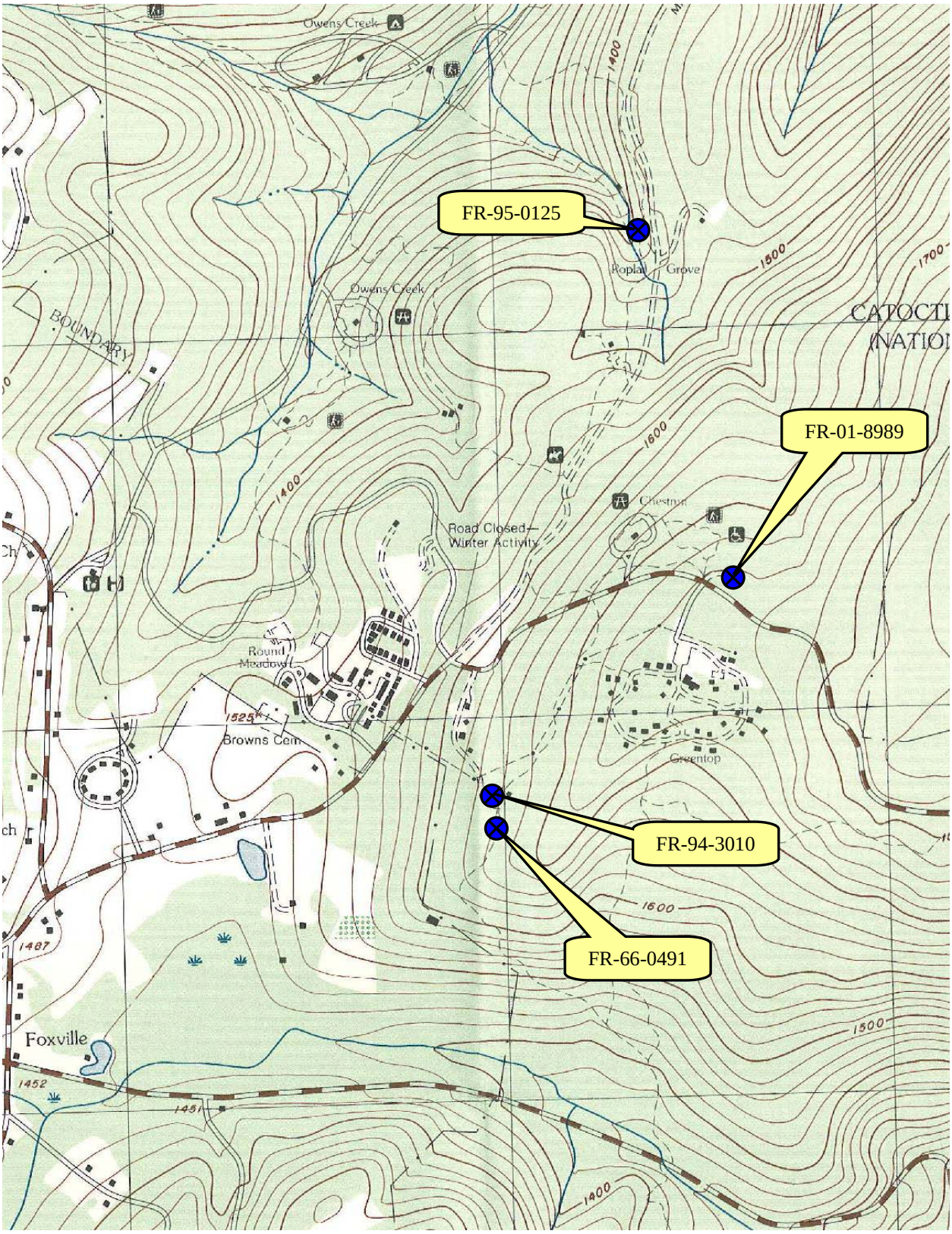

Figure 8. Inactive wells in the Ike Smith, Greentop, Jim Brown areas.

Water Use and Potential for Streamflow Depletion

Firm figures for water use at the park were not available. The estimated peak use (per John Hart, Facility Manager) for the various systems is:

Round Meadow	11,000 gpd
Ike Smith	15,000 gpd
Blue Blazes	12,000 gpd summer
	9,000 gpd winter

There are no plans to develop additional facilities at the park, and thus, it's not likely that water use will increase in the future. Usage might decrease as older toilets and showerheads are replaced with low-flow fixtures.

All groundwater has the potential to flow toward, and discharge to, adjacent streams. Pumping groundwater from a well near a stream intercepts some of the groundwater flowing toward the stream, resulting in streamflow depletion. The amount of streamflow depletion is a function of the depth of the well, the distance from the stream, and the degree of interconnection between the stream and groundwater at that particular site. As a worst-case analysis, we can assume a perfect connection between groundwater pumping and streamflow reduction. That is, streamflow is reduced by an amount equal to the rate of groundwater pumping. As an example, we could assume that all of the water demand for the Ike Smith water system is pumped from the new Ike Smith Well adjacent to Owens Creek. Pumping the well continuously at 15,000 gpd is the equivalent of 0.02 cfs. The maximum amount of streamflow depletion from pumping the well is 0.02 cfs.

In reality the impact of groundwater pumping on streamflow is reduced by the return of most of the water to the groundwater system by infiltration through septic leachfields. The numbers given for peak demand represent the maximum pumping from the various wells; demand is much lower on many days. Also, most of the water systems obtain water from a number of wells at various distances from streams. As the volume of water pumped in any given day decreases and the distance from the stream increases, the amount of streamflow depletion decreases.

Recommended Locations for Well Construction

The strike of geologic formations underlying the park generally follows a NE-SW trend. Many of the stream valleys are oriented along this same trend because it is easier for natural erosion processes to follow the natural fracture patterns in the bedrock than perpendicular to the natural fracture pattern.

The dip of the formations is southeasterly at about 40-50º. A dip of 45 º would have a slope of 1:1. If we have a situation where a stream valley has formed over a fractured section of the rock units (the fractured rock being more easily erodible), we may have groundwater recharge occurring as infiltration from the stream into the outcrop of the rock. The groundwater could then flow down the dipping slope of the fractured rock and could be intercepted by a well drilled a short distance downgradient (southeast) from the stream. This scenario is shown in the following sketch (Figure 9). Because the dip of the geologic formations is approximately 45º, the rock units underlying the stream will be 100 feet deeper for every 100 feet that the well is located southeast from the stream.

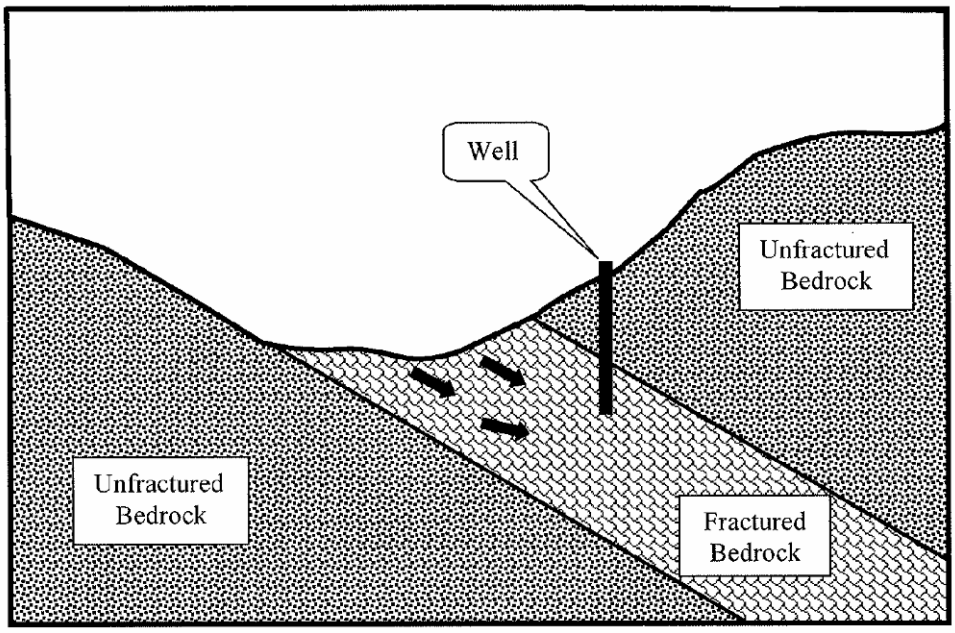

Figure 9. Hydrogeologic model for siting well locations.

It appears that two of the most productive wells, Blue Blazes No. 1and the new Ike Smith well, fit this hydrogeologic model. However, the Jim Brown No. 4 well does not fit this model and yet produces 100 gpm.

Successful development of water-supply wells at Catoctin is mostly dependent on encountering fracture zones below the water table and the degree to which those fracture zones are interconnected with other water-bearing fractures. It is nearly impossible to conduct surface analyses to determine whether there will be fractures at some depth and even more problematic determining whether those fractures will yield significant amounts of water to a well. The odds of obtaining water from a well can be increased by locating new wells geologically "downgradient" from streams, but it doesn't guarantee success.

The seemingly random pattern of fracturing in the bedrock at Catoctin can readily be illustrated by looking at past well drilling. Four deep (400-800 feet) wells have been drilled in the vicinity of the Jim Brown Wells (Figures 5 & 8). Two of these wells produce large amounts of water (75-100 gpm), and two of the wells produce less than 10 gpm. At Misty Mount, two wells were drilled in the same geologic setting, the bottom of the valley east of the creek (Figure 7). One of the wells produced 25 gpm, and the other produced 3 gpm.

Typical Well Construction

Typical construction for wells at Catoctin Mountain Park is shown in Figure 10. An oversize borehole (usually 12-14 inches diameter) is drilled through the soil and weathered bedrock comprising the regolith, penetrating several feet into bedrock. Well casing (6-8 inch inside diameter) is placed in the hole, and the annular space is filled with cement grout to form a surface seal to prevent downward flow of surface water into the borehole. The well is completed by drilling an uncased, open borehole into the fractured bedrock. Generally, the well casing and cement grout seal extends to about 40-60 feet below ground surface. Wells drilled prior to 2002 were generally no more than 200-250 feet total depth. Wells drilled in 2002 and later range from 400-800 feet deep.

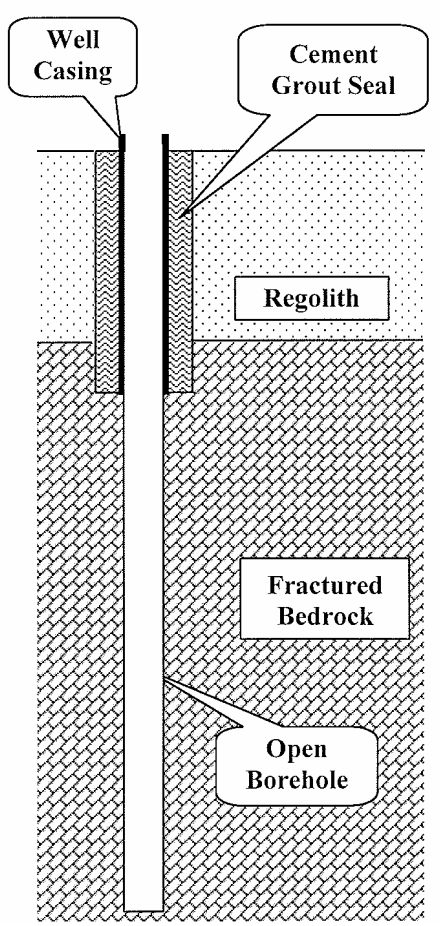

Figure 10. Typical well construction at Catoctin Mountain Park.

Recommendations

Some of the inactive wells in the park could function as low-yield, supplemental supply wells. Constructing a well in this type of geologic environment that will yield more than 20 gpm should be considered unusual. It's much more likely that a well drilled in fractured metamorphic rock would yield less than 10 gpm. A 10 gpm well operated on a schedule of 8 hours on and 16 hours off will produce nearly 5,000 gpd. A couple of low-yield wells and adequate storage tanks can result in a viable water system.

Some of the previously constructed, and currently inactive, wells might be very good supply wells. For example, the well at Greentop was reportedly test pumped at 25 gpm for 24 hours

with only 10 feet of drawdown. This would seem to indicate that it would be a very good well, but it has never been utilized. Before more wells are drilled at the park, records should be reviewed and existing inactive wells should be tested to determine whether they might meet the need.

Water levels in the existing wells should be measured on a regular basis to monitor water table changes in response to groundwater pumping, natural seasonal cycles, and drought effects. These data can also be used to identify problems with the pump or piping in a well. Often when a well stops pumping water or the pumping rate decreases, the first reaction is that the well must have gone dry, or is going dry. It's more likely that the pump is wearing out and pumps less efficiently, or there is a leak somewhere in the piping. Regular water-level monitoring will help diagnose production problems by identifying whether the problem lies with the pumping equipment or with the aquifer. Quarterly water level monitoring would be optimal; semiannual monitoring should be considered the minimum amount of data needed.

Glossary

Anticlinorium – A regional anticlinal structure that may include smaller anticlines and synclines. A sketch of the Catoctin Mountain anticlinorium from Whitaker (1955) is shown below.

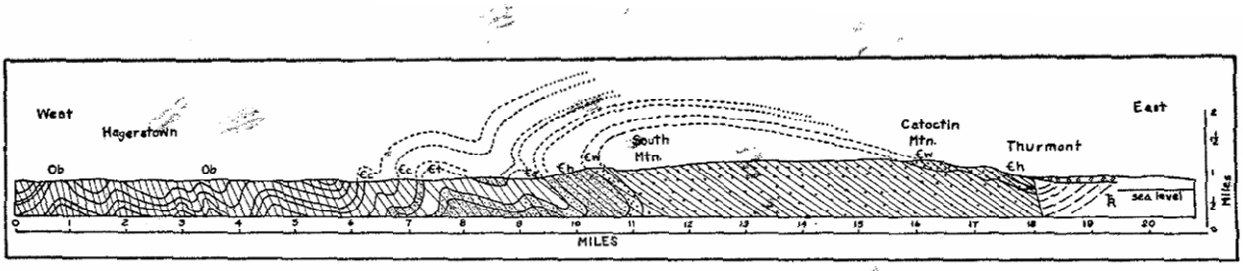

FIGURE 2.—SOUTH MOUNTAIN FOLD
After Cloos (1947, p. 857)

Metabasalt – A basalt that has undergone metamorphism. Often called greenstone.

Metarhyolite – Rhyolitic rock that has undergone metamorphism. The metarhyolite at Catoctin has a bluish or bluish-gray hue.

Phyllite – A metamorphic rock similar to schist but finer grained, so that the constituent grains cannot be seen with the unaided eye. Phyllite is considered to be a product of low-grade metamorphism. It is transitional between slate and schist.

Regolith – The regolith is everything from land surface down to solid bedrock. It includes soil and partially weathered rock overlying bedrock.

Literature Cited

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Otton, E.G., 1955, *Memorandum on present status of the ground-water supply at Catoctin National Park, Camps No. 2 and 3, Thurmont, MD*, unpublished memo by U.S. Geological Survey dated July 12, 1955, 4 pages.

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Whitaker, John C., 1955, *Geology of Catoctin Mountain*, Bulletin of Geological Society of America, vol. 66, pp. 436-462

Appendix

Well Completion Reports

Wells are listed in order of construction, oldest well first.

Greentop Well	1955
Misty Mount No. 1	1955
Deepen Misty Mount No. 1	1956
Misty Mount No. 2	1956
Blue Blazes No. 1	1958
Poplar Grove No. 1	1966
Poplar Grove No. 2	1966
Jim Brown No. 1	1966
Jim Brown No. 2	1966
Headquarters Well	1971
Quarters No. 5	1983
Jim Brown No. 3	2002
Jim Brown No. 4	2002
Ike Smith Test Hole	2006
Test Hole at Blue Blazes	2006
Blue Blazes No. 2	2006
Test Hole at Bldg. 167	2006
Ike Smith Well	2006

18789

Form 4

STATE OF MARYLAND
DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES
The Johns Hopkins University
BALTIMORE 18, MARYLAND

Greentop Well

FRO/8989

APPLICATION FOR PERMIT TO DRILL WELL

An application must be submitted and permit received before drilling a well

Owner: Potomac River Naval Command

Street or R. F. D.: U.S. Naval Gun Factory

Post Office: Washington 25, D.C.

Driller: Columbia Pump & Well Co.

Street or R. F. D.: 232 Gallatin St, N.W.

Post Office: Washington 11, D.C.

Date: April 29, 1955

Quantity of Water Needed (G. P. M.): 20

Use for Water: General Use

Approximate Depth of Well (feet): 250

Method of Drilling to be used: Cable Tool

Location of Well

County: Frederick

Nearest Town: Thurmont, Maryland

Distance from Town: approx 6 mile

Direction from Town: West

Description of Location of Well

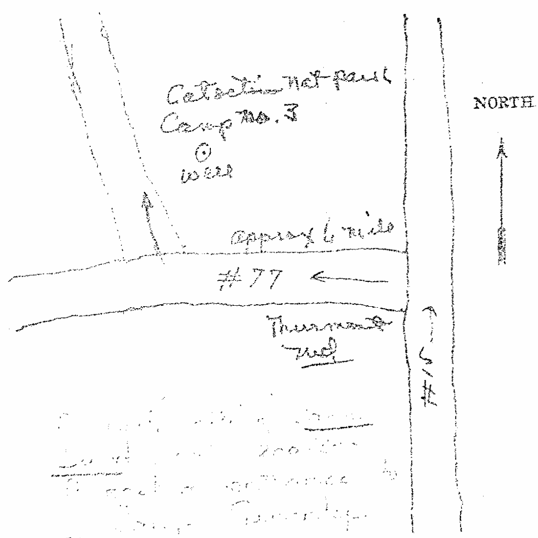
(This information should be definite enough to permit locating well on a county map)

Near what road: Catoctin National Park

On which side of road: North (North, East, South, West)

Distance from road: 3/4 mile

Draw a sketch below showing location of well in relation to nearby towns, roads and streams with north in the direction of the arrow.



PERMIT TO DRILL WELL

(Permit to be returned to Driller)

NOT TO BE FILLED IN BY DRILLER

Permit No. 18989

Samples of Cuttings Required by Department: Yes / No

Owner Requires Permit to Appropriate Water: Yes / No

Owner Has Permit to Appropriate Water: Yes / No

The applicant is herewith granted a permit to drill this well subject to the conditions stipulated.

[signature] Director

Date: [illegible]

Special conditions that may apply:

Owner's acceptance of ~~regulations~~ for military ~~purposes~~.

050255

Sample sacks furnished by U.S.G.S.

Permit issued National Park Service 8/18/55

(ORIGINAL)

Form 5

STATE OF MARYLAND
DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES
The Johns Hopkins University
BALTIMORE 18, MARYLAND

060755

230

FR018989

WELL COMPLETION REPORT

This report must be submitted within 30 days after completion of the well

8 230 WELL DESCRIPTION

WELL LOG State the kind of formations penetrated, their depth, their thickness, and if water-bearing	FEET from...to...	CASING AND SCREEN RECORD State the kind and size of casing, liner, shoe, screen, and other accessories (if no casing used, give diameter of well)	DIAM. (Inches)	FEET from 0 to 230
	0-30	57ft8" pipe in place.	8"	
Clay	30-35	1 - 8" shoe		
Boulders	35-65			
Lime Stone	65-70			
Lime Stone-opening	70-230			
Lime Stone				

Length of air line: 195'

Same pump on 6-4-65 (# ...914)

Chlorinator not attached

Well not used.

Permit Number 18989

Name of Owner Potomac River Naval Comman.

PUMPING TEST

Hours Pumped 24

Type of Pump Used Turbine

Pumping Rate Gallons per Minute 25

WATER LEVEL

Distance from land surface to water:

Before Pumping 12 Ft.

When Pumping 36 to 40

APPEARANCE OF WATER

Clear Clear

Cloudy

Taste Ok

Odor None

Height of Casing Above Land Surface 1 Ft.

PUMP INSTALLED

Type Turbine

Capacity

Gallons per Minute 20

Gallons per Hour 1200

Pump Column Length 200 Ft.

REMARKS

Well Was Completed

Date June 7,1955

Well Driller

Columbia Pump & Well Co

Signature

21967

Form 4

STATE OF MARYLAND

DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES

The Johns Hopkins University

BALTIMORE 18, MARYLAND

Misty Mount No. 1

[redacted]

FR021967

APPLICATION FOR PERMIT TO DRILL WELL

An application must be submitted and permit received before drilling a well

Owner CATOCTIN MOUNTAIN PARK NATIONAL PARK SERVICE Thurmont MD

Driller Elvin R. Smith

Street or R. F. D. / Post Office Smithsburg md.

Street or R. F. D. ....

Post Office THURMONT ORDER NO 15-952

Date Dec 26, 55

Quantity of Water Needed (G. P. M.) 5

Use for Water Camp

Approximate Depth of Well (feet) 150

Method of Drilling to be used Keystone

Location of Well

County Frederick

Nearest Town Thurmont

Distance from Town 3 miles

Direction from Town West

PERMIT TO DRILL WELL

(Permit to be returned to Driller)

NOT TO BE FILLED IN BY DRILLER

Permit No. 21967

Samples of Cuttings Required by Department {Yes / No

Owner Requires Permit to Appropriate Water {Yes / No

Owner Has Permit to Appropriate Water {Yes / No

The applicant is herewith granted a permit to drill this well subject to the conditions stipulated.

[signature] Director

Date January 17, 1956

Special conditions that may apply:

Owner's permit issued 1/17/56

011756

Description of Location of Well

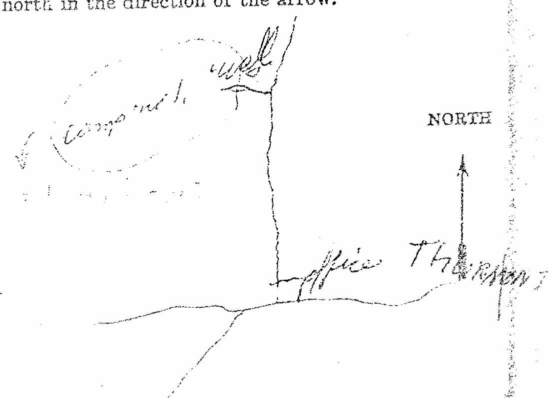
(This information should be definite enough to permit locating well on a county map)

Near what road Foxville to Thurmont

On which side of road North (North, East, South, West)

Distance from road 1/2 mile camp no. 1

Draw a sketch below showing location of well in relation to nearby towns, roads and streams with north in the direction of the arrow.



(DUPLICATE)

110154

Form 5

STATE OF MARYLAND

DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES

The Johns Hopkins University
BALTIMORE 18, MARYLAND

FR021967

WELL COMPLETION REPORT

This report must be submitted within 30 days after completion of the well

76

Permit Number 21967

Name of Owner NATIONAL PARK SERVICE

6 43

WELL DESCRIPTION

WELL LOG — State the kind of formations penetrated, their depth, their thickness, and if water-bearing

Formation	FEET from ... to ...
Earth	0 – 5'
mud	5 – 30
Rock	30 – 42
Water Bearing at	42
Rock	42 – 51
water bearing at	51
Rock water bearing	51 – 76

CASING AND SCREEN RECORD — State the kind and size of casing, liner, shoe, screen, and other accessories (if no casing used, give diameter of well)

Kind	DIAM. (inches)	FEET from ... to ...
[illegible]	8"	0 – 17 6"
[illegible]	6"	0 – 12 6"

PUMPING TEST

Hours Pumped 4

Type of Pump Used [illegible]

Pumping Rate Gallons per Minute 11

WATER LEVEL

Distance from land surface to water:

Before Pumping [illegible] Ft.

When Pumping 64 Ft.

APPEARANCE OF WATER

Clear

Cloudy ✓

Taste

Odor

Height of Casing Above Land Surface 2 Ft.

PUMP INSTALLED

Type

Capacity

Gallons per Minute

Gallons per Hour

Pump Column Length Ft.

REMARKS

This well was not finished by me found [illegible] another [illegible] working [illegible] [illegible]

Well Was Completed

Date [illegible]

Well Driller [illegible]

Signature

EX Post FACto FIling 25347

Form 4

STATE OF MARYLAND
DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES
The Johns Hopkins University
BALTIMORE 18, MARYLAND

FR# 25349

Deepen
Misty Mount No. 1

APPLICATION FOR PERMIT TO DRILL WELL

An application must be submitted and permit received before drilling a well

Kohl Bros

Owner Catoctin Nat. Park Service
Street or R F. D.
Post Office Thurmont, Md

Driller William Miller
Street or R. F. D.
Post Office Emmitsburg, MD
Date 11/8/56

Quantity of Water Needed (G. P. M.) 10
Use for Water PARK Public service I
Approximate Depth of Well (feet) 180'
Method of Drilling to be used CABLE tools CHURN DRILL C

PERMIT TO DRILL WELL

(Permit to be returned to Driller)

NOT TO BE FILLED IN BY DRILLER

Permit No. 25349

Samples of Cuttings Required by Department {Yes / No}

Owner Requires Permit to Appropriate Water {Yes / No}

Owner Has Permit to Appropriate Water {Yes / No}

The applicant is herewith granted a permit to drill this well subject to the conditions stipulated.

Director

Date 11/13/56

Special conditions that may apply:

See P21,967 for part of hole drilled by Elvin R. Smith.

Location of Well

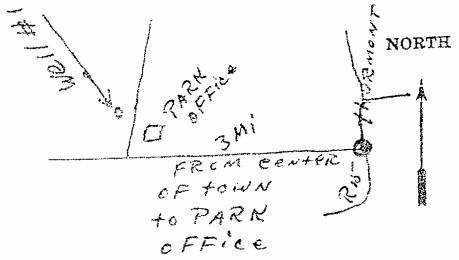
County Frederick
Nearest Town Thurmont
Distance from Town 3.5
Direction from Town West

Description of Location of Well

(This information should be definite enough to permit locating well on a county map)

Near what road N. of PARK OFFICE approximately 2500'
On which side of road ON Left or West side (North, East, South, West)
Distance from road 40' FROM PARK DRIVE

Draw a sketch below showing location of well in relation to nearby towns, roads and streams with north in the direction of the arrow.



this is not to scale
ROADS ARE ONLY GENERAL DIRECTIONS

(ORIGINAL)

Ex Post Facto Filing Well #1

STATE OF MARYLAND

Form 5

DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES

The Johns Hopkins University
BALTIMORE 18, MARYLAND

FR# 25349

WELL COMPLETION REPORT

This report must be submitted within 30 days after completion of the well

6 76 WELL DESCRIPTION

WELL LOG

State the kind of formations penetrated, their depth, their thickness, and if water-bearing

	FEET from	to
HARD CONGLOMERATE	76	180

CASING AND SCREEN RECORD

State the kind and size of casing, liner, shoe, screen, and other accessories (if no casing used, give diameter of well)

	DIAM. (inches)	FEET from	to
6"			

LENGTH OF CASING MAY HAVE BEEN FILED BY ELVIN R. SMITH PERMIT # 21967, NOT COMPLETED, BUT DRILLED DEEPER BY KOHL BROS.

Permit Number 25349

Name of Owner CATOCTIN NAT'L PARK SERVICE

PUMPING TEST

Hours Pumped 24

Type of Pump Used PLUNGE

Pumping Rate Gallons per Minute 3.6

WATER LEVEL

Distance from land surface to water:

Before Pumping 0 Ft.

When Pumping 168 Ft.

APPEARANCE OF WATER

Clear CLEAR

Cloudy

Taste

Odor

Height of Casing Above Land Surface +1 Ft.

PUMP INSTALLED

Type NEW

Capacity ABANDONED BUT

Gallons per Minute

Gallons per Hour CAPPED

Pump Column Length Ft.

REMARKS

Well Was Completed

Date APR. 19, 1956

Well Driller WM. MILLER

PER KOHL BROS., Richard D. Kohl

Signature

Ex Post Facto Filing 25350

Form 4

STATE OF MARYLAND
DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES
The Johns Hopkins University
BALTIMORE 18, MARYLAND

FR# 25350 Misty Mount No. 2

APPLICATION FOR PERMIT TO DRILL WELL

An application must be submitted and permit received before drilling a well

Owner Catoctin Nat'l Park Service Driller William Miller / Kohl Bros

Street or R. F. D. ..... Street or R. F. D. / Post Office Emmitsburg, MD

Post Office Thurmont, MD Date 11/8/56

Quantity of Water Needed (G. P. M.) 10

Use for Water Park Public Service I

Approximate Depth of Well (feet) 127'

Method of Drilling to be used Cable tools / Churn Drill C

Location of Well

County Frederick

Nearest Town Thurmont

Distance from Town 3.6

Direction from Town West

Description of Location of Well

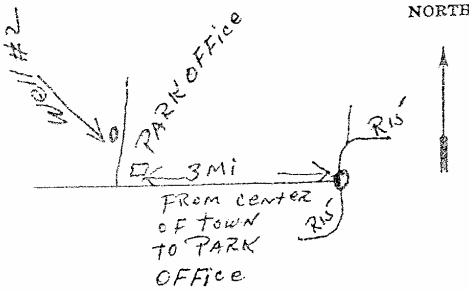
(This information should be definite enough to permit locating well on a county map)

Near what road Approximately 3000' N. of Park Office

On which side of road Left or West side (North, East, South, West)

Distance from road 100' from Park Drive

Draw a sketch below showing location of well in relation to nearby towns, roads and streams with north in the direction of the arrow.



THIS IS NOT to SCALE
ROADS ARE ONLY
GENERAL DIRECTIONS

PERMIT TO DRILL WELL

(Permit to be returned to Driller)

NOT TO BE FILLED IN BY DRILLER

Permit No. 25350

Samples of Cuttings Required by Department {Yes / No}

Owner Requires Permit to Appropriate Water {Yes / No}

Owner Has Permit to Appropriate Water {Yes / No}

The applicant is herewith granted a permit to drill this well subject to the conditions stipulated.

Joseph T. Lonsdale, Director

Date November 8, 1956

Special conditions that may apply:

11/3 56

(ORIGINAL)

EX POST FACTO FILING

STATE OF MARYLAND

Form 5

DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES

The Johns Hopkins University
BALTIMORE 18, MARYLAND

FR# 25354

WELL COMPLETION REPORT

This report must be submitted within 30 days after completion of the well

6 28 WELL DESCRIPTION

WELL LOG

State the kind of formations penetrated, their depth, their thickness, and if water-bearing

	FEET from	to
OVERBURDEN 0'-15' HARD CONGLOMERATE	15	127
FAULTED AT 65'		

CASING AND SCREEN RECORD

State the kind and size of casing, liner, shoe, screen, and other accessories (if no casing used, give diameter of well)

	DIAM. (inches)	FEET from	to
CASING	6"	-1	+28'
CEMENT GROUT POURED AROUND 6" CASIN FILLING AREA MADE BY 8" BIT TO 28'			

per Kohl BROS

Permit Number 25354

Name of Owner CATOCTIN NAT. PARK SERVICE

PUMPING TEST

Hours Pumped 24

Type of Pump Used PLGR

Pumping Rate Gallons per Minute 24

WATER LEVEL

Distance from land surface to water:

Before Pumping 0 F

When Pumping 105 F

APPEARANCE OF WATER

Clear CLEAR

Cloudy

Taste

Odor

Height of Casing Above Land Surface +1 F

PUMP INSTALLED

Type SUBMERSIBLE

Capacity

Gallons per Minute 20

Gallons per Hour 1200

Pump Column Length 105 F

REMARKS

1ST WATER 40'
2ND WATER 65'
BALANCE OF WELL APPARENTLY, NO MORE WATER

Well Was Completed

Date JULY 11, 1956

Well Driller Wm. Mills Richard R. Kohl

Signature

Form 4

STATE OF MARYLAND
DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES
The Johns Hopkins University
BALTIMORE 18, MARYLAND

Blue Blazes No. 1

FB#32795

APPLICATION FOR PERMIT TO DRILL WELL

An application must be submitted and permit received before drilling a well

Owner NATIONAL PARK SERVICE
Street or R F. D. CATOCTIN MT. PARK
Post Office THURMONT Md

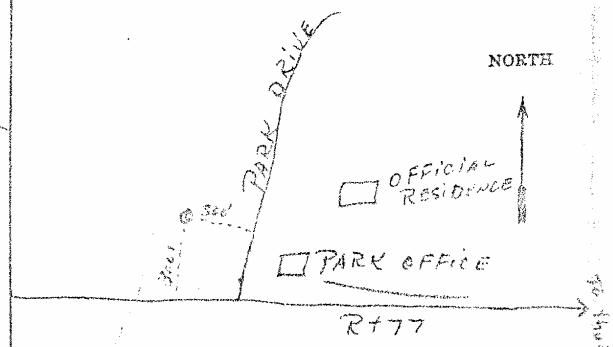
Driller WILLIAM MILLER HARRISBURG'S KOHL BROTHERS
Street or R. F. D. 21ST & GREENWOOD
Post Office HARRISBURG PA
Date 11/3/58

Quantity of Water Needed (G. P. M.) 20
Use for Water DOMESTIC D
Approximate Depth of Well (feet) 200'
Method of Drilling to be used CHURN C

Location of Well
County FREDERICK
Nearest Town THURMONT
Distance from Town 3 MI
Direction from Town N. W.

Description of Location of Well
(This information should be definite enough to permit locating well on a county map)
Near what road Rt 77
On which side of road NORTH (North, East, South, West)
Distance from road 300'

Draw a sketch below showing location of well in relation to nearby towns, roads and streams with north in the direction of the arrow.



PERMIT TO DRILL WELL

(Permit to be returned to Driller)

NOT TO BE FILLED IN BY DRILLER

Permit No. 32795

Samples of Cuttings Required by Department {Yes / No}

Owner Requires Permit to Appropriate Water {Yes / ~~No~~}

Owner Has Permit to Appropriate Water {Yes / ~~No~~}

The applicant is herewith granted a permit to drill this well subject to the conditions stipulated.

Joseph T. Singewald
Director

Date November 7, 1958

Special conditions that may apply:

Owner's permit issued 2/17/55

11#758

(ORIGINAL)

Delayed Report Filed 6/26/57

STATE OF MARYLAND

Form 5

DEPARTMENT OF GEOLOGY, MINES AND WATER RESOURCES

The Johns Hopkins University
BALTIMORE 18, MARYLAND

FB 32795

WELL COMPLETION REPORT

This report must be submitted within 30 days after completion of the well 230

6 18 WELL DESCRIPTION

WELL LOG

State the kind of formations penetrated, their depth, their thickness, and if water-bearing

FEET	
from	to
OVERBURDEN	0 to 10'
SAND ROCK	10' to 18'
COPPER ROCK	18' to 230'

CASING AND SCREEN RECORD

State the kind and size of casing, liner, shoe, screen, and other accessories (if no casing used, give diameter of well)

	DIAM. (inches)	FEET from	to
Steel "I.D. Grouted		14	

Permit Number 32795

Name of Owner National Park Service

PUMPING TEST

Hours Pumped 24

Type of Pump Used Bucket

Pumping Rate
Gallons per Minute 3+

WATER LEVEL

Distance from land surface to water:

Before Pumping [illegible] Ft.

When Pumping 2[illegible]0 Ft.

APPEARANCE OF WATER

Clear CLEAR

Cloudy

Taste NONE

Odor NONE

Height of Casing Above Land Surface 1 Ft.

PUMP INSTALLED

Type NONE

Capacity
Gallons per Minute

Gallons per Hour

Pump Column Length Ft.

REMARKS

Well Was Completed
Date 2/5/53

Well Driller [illegible]

[illegible] Signature

FREDERICK COUNTY DEPARTMENT OF HEALTH
12 East Church Street
Winchester Hall
Frederick, Maryland

Poplar Grove No. 1

...leted by well driller. Copy to be sent to the Frederick County Health ...ent within fifteen (15) days after completion of drilling.

HEALTH DEPARTMENT COMPLETION CERTIFICATE FOR PRIVATE WELLS

Date March 28, 1966

Owner of Property Catoctin Mountain Park Driller York Drilling Company, Inc. Reider Roosevelt Avenue Opposite Lincoln Park

Address Thurmont, Maryland Address York, Pennsylvania 17405

Exact location of property where well was drilled Foxville, on the Manahan Road, beyond the Job Corps Camp No. 4 well - 400' west.

If Subdivision: Name _____ Block No. _____ Lot No. _____

Permit No. F-66-W-492 (This is the number issued by the Department of Geology.

Construction and performance characteristics of well

(1) Diameter of largest bit 8"

(2) Ground water encountered at None ft.

(3) At what depth was first vei... water encountered 95 ft. Cased o...f: Yes _____ No. X

(4) Total depth of well 180 ft. Standing w... level in well b...ow ground surface when pump... 87 ft.

(5) Casing: Diame+... ...asing 6" ID Length of metal casing 76'

...e ...singjjoints watertight? Yes XX No. ___ How were these joints sealed:
by welding XX
by treaded sleeve _____

Finished casing terminates 1½ ft. above ground level 74½ ft below ground level

(6) Well cement grouted: Yes XX No. ___ To what depth 74½ ft.
(If answer to No. 6 is NO an acceptable explanation in detail is necessary _____

(7) Yield of well: 40 gal. per min. No. of hours pump operated at this rate during test 24 hours ... minutes.

(8) Log of materials encountered during drilling Burden, green rock, brown shale and sandstone

I hereby certify that the above information concerning this well is true and correct.

C. H. Reider
Well Driller
Dept. of Geology, Mines and Water Resources
License No. 92

Office Building
LIS, MARYLAND 21401

STATE OF MARYLAND
DEPARTMENT OF
WATER RESOURCES

Well #4

THIS REPORT MUST BE SUBMITTED WITHIN 30 DAYS AFTER COMPLETION OF THE WELL

WELL COMPLETION REPORT

WELL DESCRIPTION

WELL LOG
State the kind of formations penetrated, their color, their depth, their thickness, and if water-bearing

	FEET from 0 to
Boulder	57'
Green Rock	63'
Sandstone	68'
Green Rock	70'
Brown Shale & Sandstone	72'
Green Rock	79'
Shale & Sandstone	80'
Green Rock	82'
Shale & Sandstone	83'
Green Rock	85'
Shale & Sandstone	89'
Green Rock	90'
Shale & Sandstone	91'
Green Rock	93'
Shale & Sandstone	95' water
Green Rock	99'
Shale & Sandstone	100'
Green Rock	108' water
" "	124'
Shale & Sandstone	126' water
Green Rock & Quartz	180 water 140

CASING AND SCREEN RECORD
State the kind and size and position of casing, liner, shoe, screen, and other accessories (if no casing used, give diameter of well).

DIAM. (inches)	FEET from 0 to
6" Schedule 40 Pipe welded Joints	74'6"

Permit Number P-66-W-492
Owner Catoctin Mountain
Address Thurmont, Maryland
Subdivision
Section Lot

PUMPING TEST
Hours Pumped 24 hours
Type of Pump Used Submersib
Pumping Rate
Gallons per Minute 40

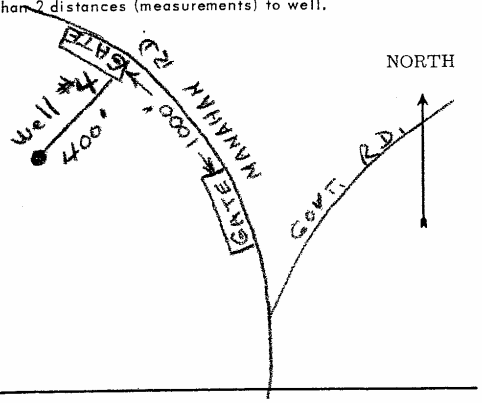
WATER LEVEL
Distance from land surface to water:
Before Pumping 60 Ft.
When Pumping 85 Ft.

APPEARANCE OF WATER
Clear XX Cloudy
Taste None
Odor None

Height of Casing Above Land Surface 18" Ft.

PUMP INSTALLED
Type
Capacity
Gallons per Minute
Gallons per Hour
Pump Column Length Ft.

LOCATION OF WELL ON LOT
Show permanent structures such as building(s), septic tank, and/or other landmarks and indicate not less than 2 distances (measurements) to well.



Date Well Was Completed 3/9/66

Well Driller C. H. REIDER
Signature C H Reider

TRIPLICATE

THE FREDERICK COUNTY DEPARTMENT OF HEALTH
12 East Church Street
Winchester Hall
Frederick, Maryland

Poplar Grove No. 2

NOTE-- To be completed by well driller. Copy to be sent to the Frederick County Health Department within fifteen (15) days after completion of drilling.

HEALTH DEPARTMENT COMPLETION CERTIFICATE FOR PRIVATE WELLS

Date March 28, 1966

Owner of Property Catoctin Mountain Park Driller York Drilling Company, Inc. Reider
Roosevelt Avenue Opposite Lincoln Park

Address Thurmont, Maryland Address York, Pennsylvania 17405

Exact location of property where well was drilled Foxville, on the Manahan Road, beyond the Job Corps Camp No. 3 well 300' west

If Subdivision: Name _____ Block No. _____ Lot No. _____

Permit No. F-66-W-489 (This is the number issued by the Department of Geology.

Construction and performance characteristics of well

(1) Diameter of largest bit 8"

(2) Ground water encountered at None ft.

(3) At what depth was first vein water encountered 59 ft. Cased off: Yes _____ No. X

(4) Total depth of well 160 ft. Standing water level in well below ground surface when pumping 85 ft.

(5) Casing: Diameter of casing 6" I.D. Length of metal casing 46

Are casing joints watertight? Yes XX No. How were these joints sealed:
by welding XX
by treaded sleeve _____

Finished casing terminates 44½ ft. above ground level 1½ ft below ground level

(6) Well cement grouted: Yes XX No _____ To what depth 44½ ft.
(If answer to No. 6 is NO an acceptable explanation in detail is necessary _____

(7) Yield of well: 35 gal. per min. No. of hours pump operated at this rate during test 24 hours _____ minutes.

(8) Log of materials encountered during drilling Burden, Blue and green rock, brown shale and gravel

I hereby certify that the above information concerning this well is true and correct.

C. H. Reider
Well Driller
Dept. of Geology, Mines and Water Resources
License No. 92

State Office Building
ANNAPOLIS, MARYLAND 21401

DEPARTMENT OF
WATER RESOURCES

Well #3

MUST BE SUBMITTED WITHIN 30 DAYS AFTER COMPLETION OF THE WELL

WELL COMPLETION REPORT

WELL DESCRIPTION

WELL LOG
State the kind of formations penetrated, their color, their depth, their thickness, and if water-bearing

	FEET from 0 to
Burden	37'
Hard Blue Rock	45'
" Green "	58'
Damp Gravel	59'
Hard Green Rock	73'
Brown Shale	74'
Gravel & Brown Shale	78' water
Soft Green & Brown Shale	87'
Green Rock	107'
Brown Shale & Gravel	110'
Hard Blue & Green Rock	160'

CASING AND SCREEN RECORD
State the kind and size and position of casing, liner, shoe, screen, and other accessories (if no casing used, give diameter of well).

DIAM. (inches)	FEET from 0 to
6" Schedule 40 Pipe welded	44'6"

Permit Number F-66-W-48
Owner Catoctin Mountain
Address Thurmont, Maryl
Subdivision
Section Lot

PUMPING TEST
Hours Pumped 24
Type of Pump Used Submersil
Pumping Rate 35
Gallons per Minute 35

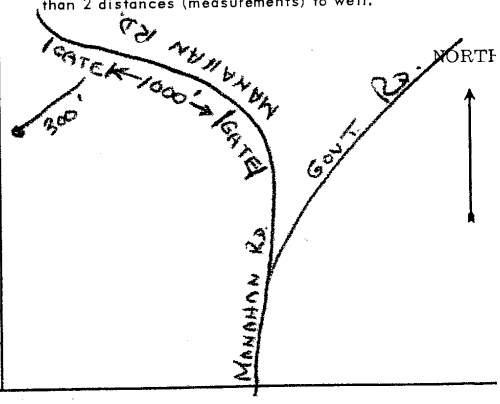
WATER LEVEL
Distance from land surface to water:
Before Pumping 55 F
When Pumping 86 F

APPEARANCE OF WATER
Clear XX Cloudy
Taste None
Odor None

Height of Casing Above Land Surface 18" F

PUMP INSTALLED
Type
Capacity
Gallons per Minute
Gallons per Hour
Pump Column Length F

LOCATION OF WELL ON LOT
Show permanent structures such as building(s), septic tank, and/or other landmarks and indicate not less than 2 distances (measurements) to well.



Date Well Was Completed 3/14/66

Well Driller C. H. REIDER
Signature C. H. Reider

TRIPLICATE

THE FREDERICK COUNTY DEPARTMENT OF HEALTH
12 East Church Street
Winchester Hall
Frederick, Maryland

Jim Brown No. 1

To be completed by well driller. Copy to be sent to the Frederick County Health Department within fifteen (15) days after completion of drilling.

HEALTH DEPARTMENT COMPLETION CERTIFICATE FOR PRIVATE WELLS

Date April 5, 1966

Owner of Property Catoctin Mountain Park Driller York Drilling Company, Inc. C. Reider

Address Thurmont, Maryland Address Roosevelt Avenue Opposite Lincoln Park York, Pennsylvania 17405

Exact location of property where well was drilled Foxville, on the Manahan Road, beyond the Job Corps Camp No. 1 Well -- 1,100 ft. west of Manahan Road - Chestnut Camp Site.

If Subdivision: Name _____ Block No. _____ Lot No. _____

Permit No. F-66-W-490 (This is the number issued by the Department of Geology.

Construction and performance characteristics of well

(1) Diameter of largest bit 8"

(2) Ground water encountered at _____ ft.

(3) At what depth was first vei. water encountered 28 ft. Cased o f: Yes _____ No. xx

(4) Total depth of well 120 ft. Standing w[illegible] level in well b[illegible]ow ground surface when pumping 74 ft.

(5) Casing: Diame[illegible]asing 6" Length of metal casing 27

Are casing joints watertight? Yes xx No. ____ How were these joints sealed:
by welding xx
by treaded sleeve _____

Finished casing terminates 1½ ft. above ground level 25½ ft below ground level

(6) Well cement grouted: Yes xx No____ To what depth 25½ ft.
(If answer to No. 6 is NO an acceptable explanation in detail is necessary _____

(7) Yield of well: 74 gal. per min. No. of hours pump operated at this rate during test 24 hours 0 minutes.

(8) Log of materials encountered during drilling Hard grey and blue rock interbedded with grave veins

I hereby certify that the above information concerning this well is true and correct.

C. H. Reider
Well Driller
Dept. of Geology, Mines and Water Resources
License No. 92

State Office Building
ANNAPOLIS, MARYLAND 21401

STATE OF MARYLAND
DEPARTMENT OF
WATER RESOURCES

Well #1

THIS REPORT MUST BE SUBMITTED WITHIN 30 DAYS AFTER COMPLETION OF THE WELL

WELL COMPLETION REPORT

WELL DESCRIPTION

Permit Number F-66-W-490
Owner Catoctin Mountain Pa
Address Thurmont, Maryland
Subdivision
Section Lot

WELL LOG

State the kind of formations penetrated, their color, their depth, their thickness, and if water-bearing

	FEET from 0 to
Burden	10'
Hard Grey Rock	28'
Gravel - Water	32'
Grey & Blue Rock	39'
Brown Rock & Gravel - Water	41'
Brown & Blue Rock	71'
WATER	74'
Gravel - Water	77'
Hard Blue Rock	100'
Quartz	110'
Hard Green Rock	120'

CASING AND SCREEN RECORD

State the kind and size and position of casing, liner, shoe, screen, and other accessories (if no casing used, give diameter of well).

DIAM. (inches)	FEET from 0 to
6" I.D. Steel	25½'

PUMPING TEST

Hours Pumped 24
Type of Pump Used Submersibl
Pumping Rate 74 Gal. Per. Mi
Gallons per Minute 74

WATER LEVEL

Distance from land surface to water:
Before Pumping 29 Ft.
When Pumping 70 Ft.

APPEARANCE OF WATER

Clear XX Cloudy
Taste None
Odor None

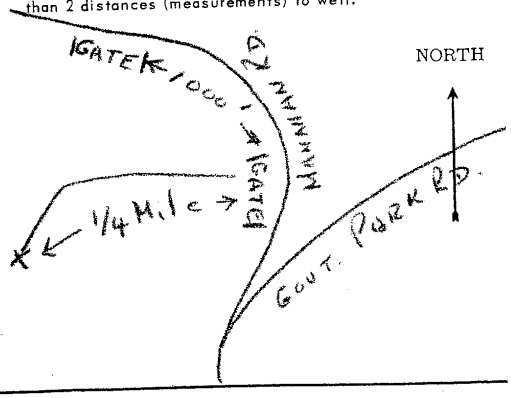
Height of Casing Above Land Surface 1½ Ft.

PUMP INSTALLED

Type
Capacity
Gallons per Minute
Gallons per Hour
Pump Column Length Ft.

LOCATION OF WELL ON LOT

Show permanent structures such as building(s), septic tank, and/or other landmarks and indicate not less than 2 distances (measurements) to well.



Date Well Was Completed 3-29-66

Well Driller C. H. Reider
Signature C. H. Reider

[redacted] DEPARTMENT OF HEALTH
12 East Church Street
Winchester Hall
Frederick, Maryland

Jim Brown No. 2

NOTE-- To be completed by well driller. Copy to be sent to the Frederick County Health Department within fifteen (15) days after completion of drilling.

HEALTH DEPARTMENT COMPLETION CERTIFICATE FOR PRIVATE WELLS

Date May 19, 1966

Owner of Property Catoctin Mountain Park Driller York Drilling Company, Inc. C. Reider
Roosevelt Avenue Opposite Lincoln Park
Address Thurmont, Maryland Address York, Pennsylvania 17404

Exact location of property where well was drilled Foxville, on the Manahan Road beyond the Job Corps Camp No. 2 Well - 1,000 ft. west.

If Subdivision: Name _____ Block No. _____ Lot No. _____

Permit No. F-66-W491 (This is the number issued by the Department of Geology.

Construction and performance characteristics of well

(1) Diameter of largest bit 8" 8"

(2) Ground water encountered at 28 28 ft.

(3) At what depth was first vei water encountered 53 53 ft. Cased o f: Yes _____ No. XX

(4) Total depth of well 250 250 ft. Standing w level in well b ow ground surface when pump 53 53 ft.

(5) Casing: Diame - asing 6" 6" Length of metal casing 46 46
Are casing joints watertight? Yes XX No. How were these joints sealed:
by welding XX
by treaded sleeve _____
Finished casing terminates 1½ 1½ ft. above ground level 44½ 44½ ft below ground level

(6) Well cement grouted: Yes XX No. To what depth 44½ 44½ ft.
(If answer to No. 6 is NO an acceptable explanation in detail is necessary _____

(7) Yield of well: 10 10 gal. per min. No. of hours pump operated at this rate during test 9 hours 15 minutes.

(8) Log of materials encountered during drilling Clay, Sand, Hard Blue Rock, Broken Formation

I hereby certify that the above information concerning this well is true and correct.

C. H. Reider
Well Driller
Dept of Geology, Mines and Water Resources
License No. 92

THE FREDERICK COUNTY DEPARTMENT OF HEALTH
12 East Church Street
Winchester Hall
Frederick, Maryland

Headquarters Well

[redacted]

NOTE -- To be completed by well driller. Copy to be sent to the Frederick County Health Department within fifteen (15) days after completion of drilling.

HEALTH DEPARTMENT COMPLETION CERTIFICATE FOR PRIVATE WELLS

Date 4-3-71

Owner of Property Dept of Interior Driller AUSTIN E. KEYSER, INC. WELL DRILLING

Address Natl Park Serv, Wash DC Address RT. 7, FREDERICK, MD. MO 2-1949

Exact location of property where well was drilled Located in Fred k Co. near town of Thurmont

If Subdivision: Name ______ Block No. ______ Lot No. ______

Permit No. FR-71-0428 (This is the number issued by the Department of Geology.)

Construction and performance characteristics of well

(1) Diameter of largest bit 9"

(2) Ground water encountered at none ft.

(3) At what depth was first vein of water encountered 63 ft. Cased off: Yes ✓ No ___

(4) Total depth of well 204 ft. Standing water level in well below ground surface when not pumping 22 ft.

(5) Casing: Diameter of casing 6 5/8 OD Length of metal casing 43
Are casing joints water tight? Yes ✓ No ___ How were these joints seal
by welding ______
by treaded sleeve ✓
Finished casing terminates 1 ft. above ground level 42 ft. below ground level.

(6) Well cement grouted: Yes ✓ No ___ To what depth 42 ft.
(if answer to No. 6 is NO an acceptable explanation in detail is necessary ______

(7) Yield of well: 12 gal. per min. No. of hours pump operated at this rate during test 1 hours ______ minutes.

(8) Log of materials encountered during drilling Clay sand & stone boulders sandstone red & gray & blue

I hereby certify that the above information concerning this well is true and correct.

Jerry Harley
Well Driller
Dept. of Geology, Mines and Water Resourc
License No. 143

NATIONAL

TWO WAST

UND MEADO CA

FREDERICK COUNTY HEALTH DEPART Quarters No. 5

k County Approval Certificate For Well Installation

US DEPT OF INTERIOR Driller AUSTIN GARVER

.D. 1109 OHIO DRIVE S.W. Street or R.F.D.

ce WASHINGTON DC 20242 Post Office

cion of property CATOCTIN MOUNTAIN NATIONAL PARK - ELS FOXVILLE-DEERFIELD RD - RANGERS QUARTERS #5

If Subdivision: Name Block or Section Lot No.

Well to furnish water to: House Commercial establishment Other

Lot Size: Width (front) Depth (l. side) Area of lot sq.ft.
(rear) (r. side) acres

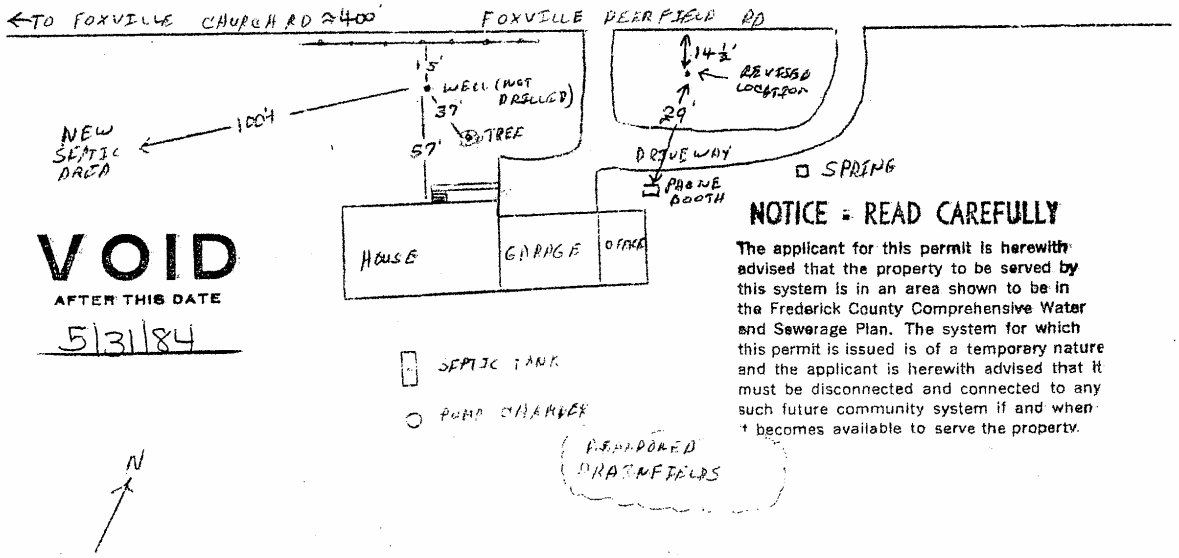
This application is made with the understanding that the well will be drilled only at the place designated by the Health Department and as shown in the sketch below. A completion certificate of this well must be filed by the driller, at the Health Department, within fifteen (15) days after completion of drilling. All well drilling operations will be carried out in accordance with regulations of the State Department of Health. Drilling at any other location, other than shown on sketch, VOIDS this approval certificate.

Date 11-4-83

Austin Garver
Signature of Applicant

Owner Contractor Well Driller ✓ Agent

TO BE COMPLETED BY HEALTH DEPARTMENT AND MADE A PART OF THIS APPLICATION 660/660



VOID
AFTER THIS DATE
5/31/84

NOTICE - READ CAREFULLY

The applicant for this permit is herewith advised that the property to be served by this system is in an area shown to be in the Frederick County Comprehensive Water and Sewerage Plan. The system for which this permit is issued is of a temporary nature and the applicant is herewith advised that it must be disconnected and connected to any such future community system if and when it becomes available to serve the property.

The property described above has been inspected and the well site approved as shown.

Date of approval 11-7-83 Sanitarian Edward Zagt

C 1 | 09830 | SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

Jim Brown No. 3

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: 4/24/02

Depth of Well: 800 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": FR-94-3010

OWNER: CATOCTIN MOUNTAIN PARK (last name / first name)
STREET OR RFD: MANAHAN TOWN: Foxville
SUBDIVISION: SECTION: LOT:

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
Top Soil	0	2	
Shaley	2	10	
Green Mountain Rock	10	260	✓
Lime Stone	260	315	
Quartz	315	320	✓
Green Mountain Rock	320	500	
Lime Stone	500	580	
Green Mountain Rock	580	700	
Blue Rock	700	800	

NUMBER OF UNSUCCESSFUL WELLS: 1

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MWD040
Dave T. Easterling
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: MWD481

SITE SUPERVISOR (sign. of driller or journeyman)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]
TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] BENTONITE CLAY [BC]
NO. OF BAGS 26 NO. OF POUNDS 2600
GALLONS OF WATER 156
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (TOP) to 30 ft. (BOTTOM)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
[ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
ST	8	62

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	depth (feet) to

SCREEN RECORD
screen type or open hole — insert appropriate code below
[ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2

EACH SCREEN	DEPTH (nearest ft.)
1	40 to 60
2	800 to
3	

SLOT SIZE 1 ____ 2 ____ 3 ____
DIAMETER OF SCREEN ____ (NEAREST INCH)
GRAVEL PACK from ____ to ____
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY
(NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 3
PUMPING RATE (gal. per min.): 6.
METHOD USED TO MEASURE PUMPING RATE: Bucket
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 50 ft.
WHEN PUMPING: 800 ft.
TYPE OF PUMP USED (for test)
[A] air [P] piston [T] turbine
[C] centrifugal [R] rotary [O] other (describe below)
[J] jet [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES [NO]
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height)
[+] above LAND SURFACE
[–] below
2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURES AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)
N
per plat

09849 (MDE USE ONLY)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

Jim Brown No. 4

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: 4/24/02

Depth of Well: 500 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": FR-94-3011

OWNER: CATOCTIN MNT PARK
STREET OR RFD: MANAHAN Rd
TOWN: THURMONT
SUBDIVISION: NATIONAL PARK
SECTION ______
LOT Well 2

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
top soil	0	2	
Shaley	2	12	
green mountain Rock	12	142	
Quartz & Brown Shale	142	148	✓
Blue stone	148	275	
green mountain Rock	275	315	✓
Blue stone	315	380	
green mountain Rock	380	500	✓

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes Y / no (N)

CIRCLE APPROPRIATE LETTER
- **A** A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- **E** ELECTRIC LOG OBTAINED
- **P** TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. MW D 040
[signature]
DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

[signature] LIC. NO. MW D 481
SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): (Y) yes / N no
TYPE OF GROUTING MATERIAL (Circle one): CEMENT (CM) / BENTONITE CLAY BC
NO. OF BAGS: 27
NO. OF POUNDS: 2700
GALLONS OF WATER: 162
DEPTH OF GROUT SEAL (to nearest foot): from 0 ft. TOP to 30 ft. BOTTOM
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)	Total depth of main casing (nearest foot)
ST	8	57

OTHER CASING (if used): diameter inch ____ depth (feet) from ____ to ____

SCREEN RECORD
screen type or open hole insert appropriate code below: ST STEEL, BR BRASS BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2

	DEPTH (nearest ft.)	
1 HO	55	500
2		
3		

SLOT SIZE 1 ____ 2 ____ 3 ____
DIAMETER OF SCREEN ____ (NEAREST INCH)

GRAVEL PACK from ____ to ____
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 ____

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING / LOG INDICATOR / OTHER DATA

C 10/15/02

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 3
PUMPING RATE (gal. per min.): 100
METHOD USED TO MEASURE PUMPING RATE: Bucket
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 50 ft.
WHEN PUMPING: 500 ft.

TYPE OF PUMP USED (for test): (A) air, P piston, T turbine, C centrifugal, R rotary, O other (describe below), J jet, S submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____
CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____
PUMP HORSE POWER ____
PUMP COLUMN LENGTH (nearest ft.) ____
CASING HEIGHT (circle appropriate box and enter casing height): (+) above / − below LAND SURFACE: 2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURES AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)
see plat

C1 3784 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

Ike Smith Test Hole

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: 8/14/06

Depth of Well: 800 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": FR-95-0125

OWNER: CATOCTIN MOUNTAIN PARK (last name / first name)
STREET OR RFD: MANAHAN ROAD — TOWN: Foxville
SUBDIVISION: IKE SMITH SITE — SECTION: W-1 — LOT: CAMP 4

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
top soil	0	1	
green mount Rock	1	4	
Lose Rocks	4	7	✓
Clay	7	10	
green mount Rock	10	16	
gravel	16	17	✓
Lose Rocks Clay	17	25	
Gravel	25	28	✓
green mount Rock	28	52	
open	52	54	
green mount Rock	54	82	
Fractured	82	83	✓
green mount Rock	83	385	
green mount Rock & Quartz	385	600	
Blue Slate	600	675	
green mount Rock	675	800	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes (Y) / no (N) — N

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MWD 040
Gary F. Easterday
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: MWD 481
SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes (Y) / no (N) — Y
TYPE OF GROUTING MATERIAL (Circle one): CEMENT (CM) BENTONITE CLAY (BC)
NO. OF BAGS: 52 NO. OF POUNDS: 5200
GALLONS OF WATER: 5200
DEPTH OF GROUT SEAL (to nearest foot): from 0 (TOP) ft. to 78 (BOTTOM) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
ST	8	80

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole insert appropriate code below: ST STEEL, BR BRASS/BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2

EACH SCREEN	DEPTH (nearest ft.)		
1	Ho	78	800
2			
3			

SLOT SIZE 1 ____ 2 ____ 3 ____
DIAMETER OF SCREEN ____ (NEAREST INCH)
from ____ to ____
GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 3
PUMPING RATE (gal. per min.): 10
METHOD USED TO MEASURE PUMPING RATE: Bucket
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 50 ft.
WHEN PUMPING: 800 ft.

TYPE OF PUMP USED (for test)
A air; P piston; T turbine; C centrifugal; R rotary; O other (describe below); J jet; S submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES / NO — NO
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height): above / below LAND SURFACE — 2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)
N
per plat

C 1 | 3783 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

Test Hole at Blue Blazes

ST/CO USE ONLY
DATE Received

DATE WELL COMPLETED: 8/14/06

Depth of Well: 600 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": FR-95-0126

OWNER: CATOCTIN MOUNTAIN PARK (last name / first name)
STREET OR RFD: PARK CENTRAL ROAD TOWN: Foxville
SUBDIVISION: MISTY MNT SITE SECTION: W #1 LOT: Camp 1

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
top Soil	0	2	
green mountrock	2	12	
Clay	12	34	
Soft mud	34	35	✓
green mount rock	35	120	
Fractured	120	121	✓
Green mount Rock	121	410	✓
green mount Rock & Quartz	410	425	✓
green mount Rock	425	600	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: M/W/D 040
George F. Easterday
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: MWD 0481

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]
TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] BENTONITE CLAY [BC]
NO. OF BAGS 22 NO. OF POUNDS 2200
GALLONS OF WATER 132
DEPTH OF GROUT SEAL (to nearest foot) from 0 ft. (TOP) to 73 ft. (BOTTOM)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
St	8	80

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	depth (feet) to

SCREEN RECORD
screen type or open hole — insert appropriate code below: [ST] STEEL [BR] BRASS BRONZE [HO] OPEN HOLE [PL] PLASTIC [OT] OTHER

C 2

DEPTH (nearest ft.)

EACH SCREEN		DEPTH (nearest ft.)	
1	Ho	78	600
2			
3			

SLOT SIZE 1 ____ 2 ____ 3 ____

DIAMETER OF SCREEN ____ (NEAREST INCH)

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

from	to

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 3
PUMPING RATE (gal. per min.): 10.
METHOD USED TO MEASURE PUMPING RATE: Bucket
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 50 ft.
WHEN PUMPING: 600 ft.

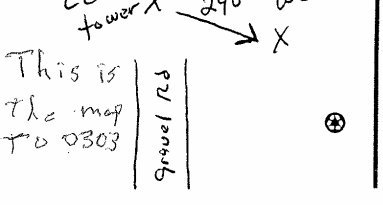
TYPE OF PUMP USED (for test)
[A] air — [P] piston — [T] turbine
[C] centrifugal — [R] rotary — [O] other (describe below)
[J] jet — [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES / NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height): [+] above / [−] below LAND SURFACE — 2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



GH 3745 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

Blue Blazes No. 2

ST/CO USE ONLY — DATE Received MM DD YY

DATE WELL COMPLETED: 8/14/06

Depth of Well: 660 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": FR-95-0303

OWNER: CATOCTIN MOUNTAIN PARK (last name / first name)

STREET OR RFD: ____ TOWN: Thurmont

SUBDIVISION: MISTY MOUNT SECTION: CAMP 1 LOT: Well 2

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
top soil	0	1	
Shale	1	5	
green mount Rock	5	25	
Soft	25	27	
green mount Rock	27	170	
green mount Rock & Quartz	170	300	✓
green mount Rock	300	660	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes [Y] no [N]

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MW D040

George L Easterday
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: MWD 481

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes [Y] no [N]

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [CM] BENTONITE CLAY [BC]

NO. OF BAGS 25 NO. OF POUNDS 3500

GALLONS OF WATER 150

DEPTH OF GROUT SEAL (to nearest foot) from 0 TOP ft. to 57 BOTTOM ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: [ST] STEEL [CO] CONCRETE [PL] PLASTIC [OT] OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
ST	8	60

OTHER CASING (if used)

EACH CASING	diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below: [ST] STEEL [BR] BRASS [BRONZE] [PL] PLASTIC [HO] OPEN HOLE [OT] OTHER

EACH SCREEN		DEPTH (nearest ft.)	
1	[C2]	Ho	58	660
2				
3				

SLOT SIZE 1 ____ 2 ____ 3 ____

DIAMETER OF SCREEN ____ (NEAREST INCH)

GRAVEL PACK — from ____ to ____

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q

TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C3 PUMPING TEST
HOURS PUMPED (nearest hour): 25

PUMPING RATE (gal. per min.): 23.

METHOD USED TO MEASURE PUMPING RATE: ORFice

WATER LEVEL (distance from land surface)

BEFORE PUMPING: 42 ft.

WHEN PUMPING: 155 ft.

TYPE OF PUMP USED (for test)
- [A] air
- [P] piston
- [T] turbine
- [C] centrifugal
- [R] rotary
- [O] other (describe below)
- [J] jet
- [S] submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

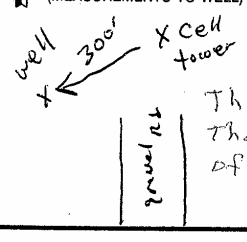
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height)
- [+] above LAND SURFACE
- [–] below

2 (nearest) foot

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



DENV-CP00 ORIGINAL

Blue Blazes No. 2

L. FRANKLIN EASTERDAY, INC[redacted]

FIELD DATA SHEET

Date: 10/1/06 Page 1 of 1

Type of Test 24 HOUR PUMPING TEST

State Tag FR-95-0303 Owner: Catoctin Mountain Park

Location: Misty Mount #2 Water Level Below (M.P): 41.6

Start Time: 9:20 M.P Above Ground: 2'

ft.well, gpm 23

Min	Time	Level	GPM	Min	Time	Level	GPM	Min	Time	Level	GPM
1	9:21	48	23	35	9:55	93.1	23	13hrs	10:20	148.2	23
2	922	52.8	23	40	10:00	95.9	23	14hrs	11:20	149.0	23
3	9:23	56.4	23	45	10:05	97.9	23	15hrs	12:20	149.6	23
4	9:24	59.3	23	50	10:10	100.5		16hrs	1:20	150.2	23
5	9:25	62.2	23	55	10:15	101.9	23	18hrs	3:20	151.7	23
6	9:26	65.6	23	60	10:20	103.6	23	20hrs	5:20	153.0	23
7	9:27	66.8	23	90	10:50	112.2	23	22hrs	7:20	154.2	23
8	9:28	68.6	23	120	11:20	119.6	23	24hrs	9:20	154.5	23
9	9:29	70.6	23	150	11:50	123.5	23		10:40	155.2	23
10	9:30	72.2	23	180	12:20	127.2	23				
12	9:32	75.0	23	210	12:50	130.6	23				
14	9:34	77.2	23	240	1:20	133.8	23				
16	9:36	79.5	23	300	2:20	137.6	23				
18	9:38	81.5	23	360	3:20	140.15	23				
20	9:40	83.2	23	420	4:20	141.95	23				
22	9:42	85.0	23	480	5:20	143.40	23				
24	9:44	86.6	23	9hrs	6:20	144.6	23				
26	9:46	88.1	23	10hrs	7:20	145.7	23				
28	9:48	89.3	23	11hrs	8:20	146.7	23				
30	9:50	90.6	23	12hrs	9:20	147.3	23				

L. FRANKLIN EASTERDAY, INC
FIELD DATA SHEET

Date: 10/12/06 Page 1 of 1
Type of Test Recovery Check
State Tag FR-95-0303 Owner:
Location: Misty Mount #2 Water Level Below (M.P):
Start Time: M.P Above Ground: 2'

ft.well, gpm

Min	Time	Level	GPM	Min	Time	Level	GPM	Min	Time	Level	GPM
1	10:41	141.9		35	11:15	107.6		13hrs			
2	10:42	142.65		40	11:20	106.4		14hrs			
3	10:43	138.0		45	11:25	105.4		15hrs			
4	10:44	133.8		50	11:30	104.2		16hrs			
5	10:45	130.8		55	11:35	103.3		18hrs			
6	10:46	128		60	11:40	102.4		20hrs			
7	10:47	125.65		90	12:10	98.2		22hrs			
8	10:48	123.55		120	12:40	94.9		24hrs			
9	10:49	121.70		150	1:10	92.2		10/13/06	10:07	44 FT	
10	10:50	120.30		180	1:40	89.9					
12	10:52	118.0		210	2:10	87.5					
14	10:54	116.1		240	2:40	85.8					
16	10:56	114.45		300							
18	10:58	113.15		360							
20	11:00	112.10		420							
22	11:02	111.25		480							
24	11:04	110.45		9hrs							
26	11:06	109.85		10hrs							
28	11:08	109.3		11hrs							
30	11:10	108.75		12hrs							

C 1 5008 — SEQUENCE NO. (MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

Test Hole at Bldg. 167

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: 9/25/04

Depth of Well: 500 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": FR-95-0304

OWNER: CATOCTIN MOUNTAIN PARK (last name / first name)

STREET OR RFD:

TOWN: THURMONT

SUBDIVISION: MISTY MOUNT SECTION: CAMP 1 LOT: Well 3

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
top soil	0	3	
Shaley	3	5	
green mount Rock	5	139	
Fractures	139	140	✓
green mount Rock	140	500	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes (Y) / no (N)

CIRCLE APPROPRIATE LETTER
- A — A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E — ELECTRIC LOG OBTAINED
- P — TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MWD 040

DRILLER'S SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO.: MWD 481

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes (Y) / no (N)

TYPE OF GROUTING MATERIAL (Circle one): CEMENT (CM) BENTONITE CLAY (BC)

NO. OF BAGS: 48 NO. OF POUNDS: 4800

GALLONS OF WATER: 288

DEPTH OF GROUT SEAL (to nearest foot): from 0 (TOP) ft. to 44 (BOTTOM) ft.

(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: STEEL (ST), CONCRETE (CO), PLASTIC (PL), OTHER (OT)

MAIN CASING TYPE: ST

Nominal diameter top (main) casing (nearest inch): 8

Total depth of main casing (nearest foot): 60

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole — insert appropriate code below: STEEL (ST), BRASS (BR), BRONZE, PLASTIC (PL), OPEN HOLE (HO), OTHER (OT)

C 2

DEPTH (nearest ft.)

EACH SCREEN

1	40	58 — 500
2		
3		

SLOT SIZE 1 ____ 2 ____ 3 ____

DIAMETER OF SCREEN ____ (NEAREST INCH)

from ____ to ____

GRAVEL PACK IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)

-T (E.R.O.S.) W Q

TELESCOPE LOG INDICATOR OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 3

PUMPING RATE (gal. per min.): 15.

METHOD USED TO MEASURE PUMPING RATE: Bucket

WATER LEVEL (distance from land surface)

BEFORE PUMPING: 50 ft.

WHEN PUMPING: 500 ft.

TYPE OF PUMP USED (for test)
- A air
- P piston
- T turbine
- C centrifugal
- R rotary
- O other (describe below)
- J jet
- S submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES / NO

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.

CAPACITY: GALLONS PER MINUTE (to nearest gallon)

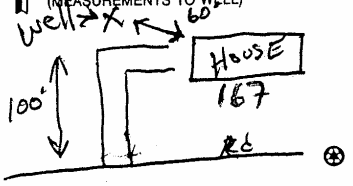
PUMP HORSE POWER

PUMP COLUMN LENGTH (nearest ft.)

CASING HEIGHT (circle appropriate box and enter casing height)
- (+) above LAND SURFACE
- (–) below

2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



(MDE USE ONLY)

(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE TYPE

Ike Smith Well

ST/CO USE ONLY
DATE Received MM DD YY

DATE WELL COMPLETED: 9/27/04

Depth of Well: 420 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WELL": FR-95-0305

OWNER: CATOCTIN MOUNTAIN PARK (last name / first name)
STREET OR RFD: MANAHAN RD TOWN: Thurmont
SUBDIVISION: IKE SMITH SITE SECTION: LOT: WELL #2

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
top Soil	0	3	
Shale	3	15	
Soft mud	15	18	
gravel	18	25	
green mount Rock	25	35	
Soft mud	35	37	
green mount Rock	37	44	
gravel	44	51	
green mount Rock	51	55	
Quartz	55	98	✓
green mount Rock	98	329	✓
open	329	380	✓
green mount Rock	380	420	

NUMBER OF UNSUCCESSFUL WELLS: 0

WELL HYDROFRACTURED: yes (Y) no (N)

CIRCLE APPROPRIATE LETTER
- A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
- E ELECTRIC LOG OBTAINED
- P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO.: MWD 040
DRILLERS SIGNATURE (MUST MATCH SIGNATURE ON APPLICATION): George F. Easterday

LIC. NO.: MWD 481

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box): yes (Y) no (N)
TYPE OF GROUTING MATERIAL (Circle one): CEMENT (CM) BENTONITE CLAY (BC)
NO. OF BAGS: 41 NO. OF POUNDS: 4180
GALLONS OF WATER: 246
DEPTH OF GROUT SEAL (to nearest foot): from 0 (TOP) ft. to 34 (BOTTOM) ft.
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below: ST STEEL, CO CONCRETE, PL PLASTIC, OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
St	8	54

OTHER CASING (if used) — EACH CASING

diameter inch	depth (feet) from	to

SCREEN RECORD
screen type or open hole, insert appropriate code below: ST STEEL, BR BRASS, BRONZE, HO OPEN HOLE, PL PLASTIC, OT OTHER

C 2 — DEPTH (nearest ft.) — EACH SCREEN

1	410	54 to 420
2		
3		

SLOT SIZE 1 ____ 2 ____ 3 ____
DIAMETER OF SCREEN ____ (NEAREST INCH)
from ____ to ____
GRAVEL PACK
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68

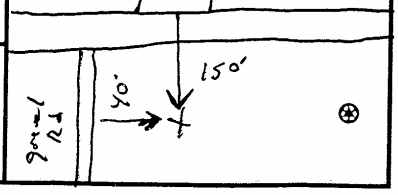
MDE USE ONLY (NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
TELESCOPE CASING | LOG INDICATOR | OTHER DATA

C 3

PUMPING TEST
HOURS PUMPED (nearest hour): 25
PUMPING RATE (gal. per min.): 100.
METHOD USED TO MEASURE PUMPING RATE: DRFICE
WATER LEVEL (distance from land surface)
BEFORE PUMPING: 17 ft.
WHEN PUMPING: 75 ft.
TYPE OF PUMP USED (for test)
- A air
- P piston
- T turbine
- C centrifugal
- R rotary
- O other (describe below)
- J jet
- S submersible

PUMP INSTALLED
DRILLER INSTALLED PUMP (CIRCLE) (YES or NO): YES (NO)
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.
TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29.
CAPACITY: GALLONS PER MINUTE (to nearest gallon)
PUMP HORSE POWER
PUMP COLUMN LENGTH (nearest ft.)
CASING HEIGHT (circle appropriate box and enter casing height): above / below LAND SURFACE: 2 (nearest foot)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



Ike Smith Well

pump set 300 FT

L. FRANKLIN EASTERDAY, INC
FIELD DATA SHEET

Page 1 of 1

Date: 10/4/06
Type of Test 24 HOUR PUMPING TEST
State Tag FR-95-0305 Owner: CATOCTIN MOUNTAIN PARK
Location: IKE Smith #2 Water Level Below (M.P): 16.45
Start Time: 9:00 M.P Above Ground: 2 1/2

ft.well, 420 gpm 100

Min	Time	Level	GPM	Min	Time	Level	GPM	Min	Time	Level	GPM
1	9.01	22.7	100	35	9.35	50.3	100	13hrs	12:00	73.1	100
2	9:02	25.2	100	40	9.40	51.6	100	14hrs	1:00	73.4	100
3	9:03	27.5	100	45	9.45	52.7	100	15hrs	2:00	73.7	100
4	9.04	29.65	100	50	9:50	53.9	100	16hrs	1:00	74.0	100
5	9:05	31.4	100	55	9:55	54.6	100	18hrs	3:00	74.3	100
6	9.06	32.85	100	60	10.00	55.3	100	20hrs	5:00	74.7	100
7	9.07	34.3	100	90	10:30	58.6	100	22hrs	7:00	75.25	100
8	9:08	35.6	100	120	11:00	61.3	100	24hrs	9:00	75.3	100
9	9.09	36.45	100	150	11:30	62.8	100	25 1/2	10:30	75.45	100
10	9.10	37.7	100	180	12.00	64.5	100				
12	9:12	39.4	100	210	12:30	65.6	100				
14	9:14	40.8	100	240	1:00	66.4	100				
16	9:16		100	300	2:00	67.8	100				
18	9:18	43.5	100	360	3:00	69.1	100				
20	9:20	44.6	100	420	4:00	69.6	100				
22	9.22	45.6	100	480	5:00	70.3	100				
24	9.24	46.5	100	9hrs	6:00	70.9	100				
26	9.26	47.3	100	10hrs	7:00	71.2	100				
28	9.28	48.1	100	11hrs	8.00	71.8	100				
30	9.30	48.8	100	12hrs	9.00	72.5	100				

L. FRANKLIN EASTERDAY, INC
FIELD DATA SHEET

Date: 10/5/06 Page 1 of 1

Type of Test Recovery Check

State Tag FR-95-0305 Owner: CATOCTIN MOUNTAIN PARK

Location: ~~FKE~~ SMITH #2 Water Level Below (M.P): _____

Start Time: _____ M.P Above Ground: _____

_____ ft.well, _____ gpm

Min	Time	Level	GPM	Min	Time	Level	GPM	Min	Time	Level	GPM
1	10:31	73.2		35	11:05	52.6		13hrs			
2	10:32	72.6		40	11:10	49.5		14hrs			
3	10:33	72.0		45	11:15	45.6		15hrs			
4	10:34	71.5		50	11:20	42.4		16hrs			
5	10:35	71.0		55	11:25	40.15		18hrs			
6	10:36	70.5		60	11:30	37.8		20hrs			
7	10:37	70.0		90	12:00	30.0		22hrs			
8	10:38	69.45		120	12:30	28.3		24hrs			
9	10:39	69.0		150	1:00	25.5					
10	10:40	68.45		180	1:30	22.4					
12	10:42	67.3		210							
14	10:44	66.2		240							
16	10:46	65.0		300							
18	10:48	63.8		360							
20	10:50	62.6		420							
22	10:52	61.5		480							
24	10:54	60.0		9hrs							
26	10:56	58.8		10hrs							
28	10:58	57.3		11hrs							
30	11:00	56.2		12hrs							

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS D-32, June 2007

National Park Service
U.S. Department of the Interior

Natural Resource Program Center

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